DOCUMENT RESUME

ED 045 369 SE 009 453

TITLE	Environmental Science Conference for State Supervisors of Science (Portland State University, Portland, Oregon, May 1-5, 1970).
INSTITUTION	Oregon State Univ., Portland.
SPONS AGENCY	National Science Foundation, Washington, D.C.
PUB DATE	May 70
NOTE	107p.
EDRS PRICE	EDRS Price MF-$0.50 HC-$5.45
DESCRIPTORS	*Conference Reports, Conservation Education, *Curriculum Development, Ecology, *Environmental Education, *Objectives, Science Supervision, *State Supervisors
IDENTIFIERS	National Science Foundation

ABSTRACT

The Conference report reviewed the status of man's environment and drafted guidelines for state education agencies to use for developing state programs related to environmental education. The six featured speakers and topics were: Kessler Cannon--"Report of the Governor's Committee on Natural Resources;" Dr. Harry Kramer--"Environmental Problems and Education;" Dr. Donald W. Stotler--"Environmental Education as Liberation:" Dr. Karl Dittmer--"Environmental Studies as a Basis for Science Education:" Dr. John H. Thomas--"Ecological Principles as a Part of General Education;" George Schroeder--"Industry and the Environment." Reaction panels and small group sessions followed each of the major presentations. Guidelines and conclusions resulting from the panel presentations and group sessions are presented. (BB)

EDO 45369

may 1-5, 1970/portland state university

environmental science conference for state supervisors of science

U.S. DEPARTMENT OF HEALTH, EDUCATION & WELFARE
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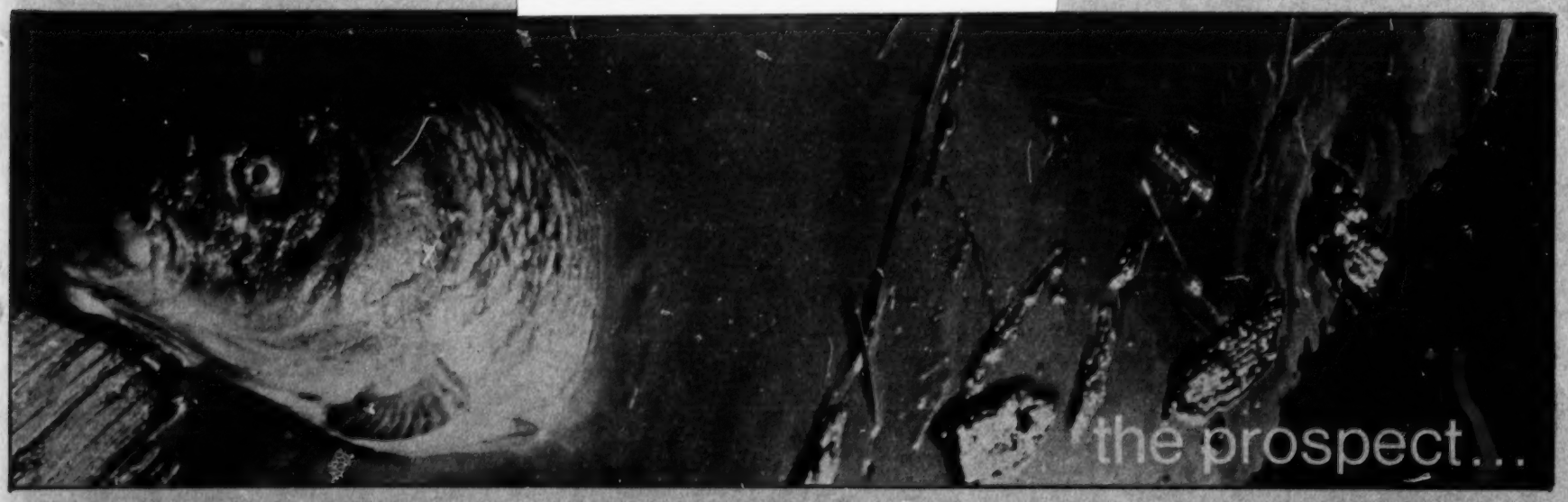

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Sponsoring organizations:

National Science Foundation
Portland State University
Oregon State Department of Education
Council of State Science Supervisors

Directors:

Michael Fiasca
George Katagiri

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FOREWORD

The State Science Supervisors' Conference on Environmental Education was held at the Sheraton Motor Inn in Portland, Oregon on May 1-5, 1970. The Conference was arranged through a proposal submitted by Portland State University to the National Science Foundation. Cooperating agencies were the Council of State Science Supervisors and the Oregon Board of Education. The primary purpose of the Conference was to review the status of man's environment and to draft guidelines with which state education agencies could develop state programs related to environmental education.

The conference featured six speakers representing various agencies in society. There was representation from state government, natural resource agencies, the scientific and academic community, education, and industry. Reaction panels and small group discussion sessions followed each of the major presentations. The consensus arrived at in the small group sessions formed the guidelines developed by this conference.

The speakers at the Conference were:

1. Kessler Cannon, Administrative Assistant to Governor Tom McCall, Governor of Oregon, and Chairman of the Governor's Committee on Natural Resources.
   Topic: "Report of the Governor's Committee on Natural Resources"
2. Dr. Harry Kramer, Director of the Office of Manpower Development, National Air Pollution Control Administration, in Research Triangle Park, North Carolina.
   Topic: "Environmental Problems and Education"
3. Dr. Donald W. Stotler, Supervisor of Science for the Portland Public Schools, Portland, Oregon.
   Topic: "Environmental Education as Liberation"
4. Dr. Karl Dittmer, Dean of the Division of Science, Portland State University, Portland, Oregon.
   Topic: "Environmental Studies as a Basis for Science Education"

5. Dr. John H. Thomas, Department of Biological Science, Stanford University.

   Topic: "Ecological Principles as a Part of General Education"

6. George Schroeder, Chief Forester for the Crown Zellerbach Corporation.

   Topic: "Industry and the Environment"

One day was devoted to a field study of man's use of natural resources. Topics which were discussed include the water and power resources of the Columbia River, the fish hatchery program, wild life, geology of the Cascade Range, agriculture in the Hood River Valley, forest management and timber utilization, and outdoor recreation. Resource personnel who assisted in the field study were:

1. Jim Anderson, Naturalist and Director of an Outdoor Resident School.
2. Anne Heisler, U. S. Forester for the Mt. Hood National Forest.
3. Dr. Ralph Mason, Oregon State Department of Geology and Mineral Industries.
4. Ernest McDonald, Education Officer for the U. S. Forest Service.

Recognizing that many state education agencies had initiated environmental education programs in their respective states, the conference devoted one session to sharing information between states: selected science supervisors reported on their programs. Additionally, each state representative was encouraged to bring any printed material published in his state: these were distributed to each participant.

The notes taken by recorders during small discussion groups were synthesized into a summary report by each of the five small groups. These were reported to the conference and discussed during the last session. These reports were summarized and form the conclusions of this report.

This report contains the major addresses and conclusions of the Conference. It is recognized that a five-day meeting cannot hope to develop a polished set of guidelines. This report contains the "first approximations" developed by state science supervisors for state education agencies. There is a need for much more experimentation and feedback. Perhaps the task that remains was summarized by Dr. Michael Fiasca, Conference Director, during the closing minutes of the conference. He emphasized two points:

1. That the development of an environmental program in the schools should involve not only personnel from the science disciplines, but also from the social sciences, recreation,

the fine arts, and other curriculum areas which could contribute towards presenting a cohesive view of a liveable environment to the learner.

2. That environmental programs should be developed independently in a number of centers rather than in one center to provide alternative programs and material to meet local or regional needs.

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Presentations Made To The Conference

My Child's Future Fairyland*

Nature has a way of striking back at us.
We rip and tear,
We cut and hurt,
We pinch, cinch, and drill.

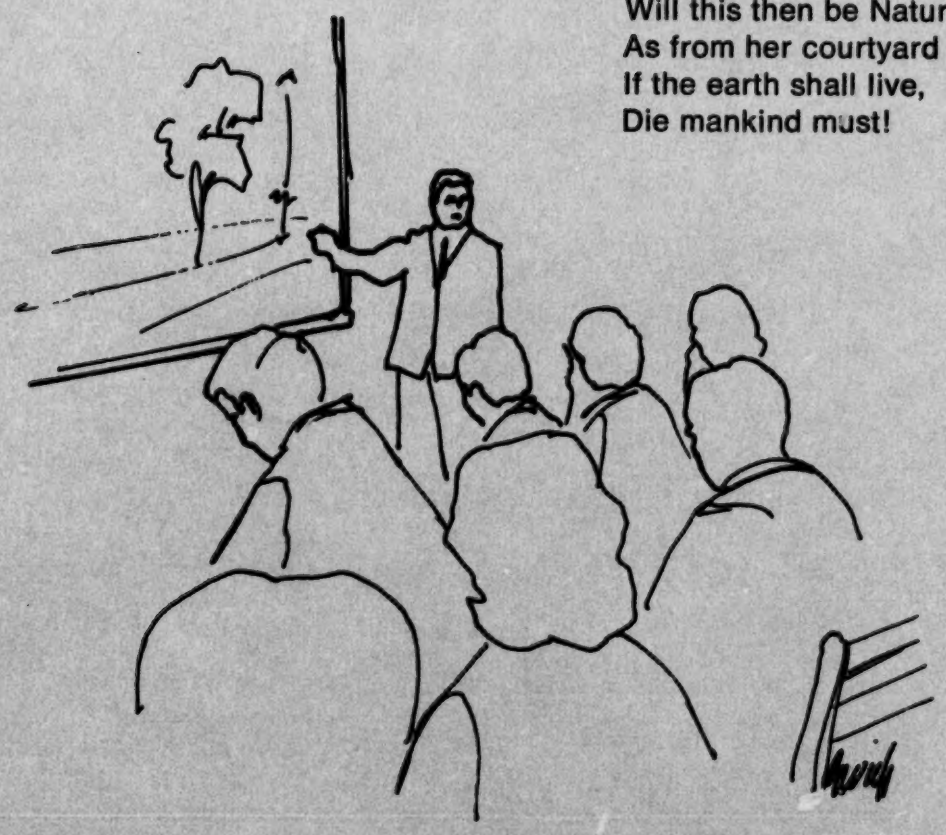
Wells a'pumping,
Factories dumping,
Sucking, spoiling, wasting earth.

But the hurt, the ache, the torture
Of unthinking, callous acts,
Repaid in biblical fashion
Visiting the iniquities of the father on the son.

What will my child use for beaches?
Oil-covered murky mire?
Where will he find parks to play in
Under a cloud of yellow haze.
Will he know brisk, blowy mornings?
Will he taste sweet jasmine scented nights?
If the air of progress is carbonic waste,
Will this be the air that fills his lungs, his eyes?

Will this then be Nature's answer,
As from her courtyard the spoilers are thrust,
If the earth shall live,
Die mankind must!

Harvey Levine



*These thoughts on man and his environment were written by students from Fasadena City College and USC as part of the response to a contest sponsored by The American Cetacean Society.

ENVIRONMENTAL STUDIES AS A BASIS FOR SCIENCE EDUCATION

Karl Dittmer

Environmental studies inevitably lead to a consideration of population. A study of population ecology provides the basis for asking many questions with answers in the biological and physical sciences. To illustrate this the film "Population Ecology" will be shown. This film will examine some of the factors which limit the growth of plant and animal populations in their natural environments. The film in itself is a good instructional audiovisual device for use in a high school science program. When it was prepared in 1963 it was suggested for use in high school or college biology studies. With an environmental sciences viewpoint it would be entirely appropriate for high school or college biology, physical science, chemistry or physics studies, and for general convocations or assemblies. In addition, many of the concepts can be introduced in the elementary and junior high school programs. The Science Curriculum Improvement Study at the University of California under the direction of Dr. Robert Karplus includes units on populations, environments, and ecosystems for elementary school children.

Before we look at the film I want to express some of my philosophies about secondary education which were not stressed in the text of the paper, which some of you reviewed. I believe that education should be and must be relevant. The sciences, the humanities, art and literature, and social studies have relevance for the improvement of man's environment, as well as for the individual's concerns for a better life.

The sciences, the humanities, art and literature, and social studies have relevance for the improvement of man's environment, as well as for the individual's concerns for a better life.

Today we live in a technological society. Our culture is a culture of technology and science. Today more than ever before, science education is extremely relevant. How we interpret the role of science and the importance of technology to students and the public is of utmost importance.

Dr. Karl Dittmer, Dean of the Division of Science,
Portland State University, Portland, Oregon.

I also feel very strongly that secondary school instruction, and especially science instruction should not be relevant to what the colleges and universities are teaching in science. These two experiences in education, the secondary school and the college, are two important steps that need not be sequential. High schools have an opportunity to do things which the colleges no longer have time to do. The practice for students to take high school chemistry or physics so that they can do better in college chemistry or physics should be discarded in my opinion. The colleges can teach the physics, chemistry, and biology, if the high schools can motivate them, can keep them excited, and arouse their curiosity by studies based on sound information. The high schools could and should cover those introductory aspects of science for which the colleges no longer have time. During the rest of my talk after the film, I will try to emphasize some of the things which I think are pertinent if we are going to do environmental-type education at the secondary and elementary school level.

I also feel very strongly that secondary school instruction, and especially science instruction should not be relevant to what the colleges and universities are teaching in science. These two experiences in education, the secondary school and the college, are two important steps that need not be sequential.

At this point the following film was shown:

"Population Ecology"
A 16 mm sound film
19 minutes
Color, No. 2144
Encyclopaedia Britannica Films Inc.

I don't know how many of you have seen the film, but I have seen it at least 7 or 8 times in the last two months and I see something different in it each time. Each time something else provokes my thoughts a little bit differently. The message of the film is strong and clear about man and human population on this earth. It is factual and not overdramatized. It uses population ecology as its theme. This is a natural theme for environmental studies, but such studies need not be limited to population. Any system in nature can be isolated and can form a good unit in some form of ecology. It could be the ecology of the species of molecules in the atmosphere, the

ecology of a power plant, or a dam, or a system of dams, or the ecology of an industrial production unit, or the ecology of your school cafeteria -- Once a system is identified and isolated all kinds of very fundamental questions can be asked and all kinds of quantitative data can be collected to make a good study and provide the bases for meaningful interpretations.

In many ways the earth with its thin layer of atmosphere is a closed, limited environment for man much like the closed jar is for fruit flies.

In many ways the earth with its thin layer of atmosphere is a closed, limited environment for man much like the closed jar is for fruit flies. If man had not learned to cultivate crops, domesticate animals, engineer nature, and control the elements, his population curve would have followed that of other animals. There would have been increases, states of equilibria, decreases, and again increases, etc., in a cyclic manner. It has been estimated that under such conditions the maximum human world population would be about 10 million people today. But man's ability to control his environment has resulted in a population of nearly 4 billion. A population of 4 billion is not as worrisome or ominous as the rate at which it reached 4 billion. It has been estimated that the human population in 1650 AD was about one-half billion. Two hundred years later, or 1850, it reached 1 billion; by 1930, 2 billion; and by 1970, probably very close to 4 billion. At the first the population doubled about every 1000 years; the next double occurred in 200 years, then in 80, and now it is doubling every 40 years.

If the lack of nutrients killed the fruit flies and the hawks kept the rabbit population in check, what will control man's population? What are man's hawks?

If the lack of nutrients killed the fruit flies and the hawks kept the rabbit population in check, what will control man's population? What are man's hawks?

When you fly across this great country of ours and see all the open spaces, not yet thickly populated and not fully used to produce food, good reason would lead almost anyone to say, "There will be food and living room for at least double or even 10 times as many people in the United States than we have now, or about 2 billion." Doubling every 40 years that would be reached in about 140 years or by about 2100 --

That is over half of the entire population of the world; by then the world population would be over 30 billion. Can the farms of the world produce that much more food? Not very likely! The chances would be a little better if the environment would not be polluted at a faster rate. Food production depends on the process of photosynthesis in green plants. Basically it is concerned with the conversion of the sun's energy into chemical energy forming sugars, starches and cellulose. The land with growing green plants plus sunlight constitutes the greatest chemical manufacturing plant in the world. The process involves CO_2 and water plus sunlight and chlorophyll of the plant, producing carbohydrates and releasing oxygen to the atmosphere. The process uses carbon dioxide from the atmosphere. When the carbohydrates are used by man or other living animals, oxygen is used and the waste products of water and CO_2 are returned to the environment. A complete cycle: CO_2 and water with the driving force of the sun's energy, carbohydrates are formed and O_2 released to the atmosphere. The carbohydrates are digested and metabolized by using O_2, giving energy, and producing CO_2. This simple photosynthetic process plus nitrogen is the source of all our food. It takes green plants, green fields and sunlight to produce. It's a marvelous machine. Can it produce twice as much? Ten times as much? Many say, "Why worry?" "We can always make synthetic foods!" That is nonsense in the long run! Synthetic foods are also carbon-carbon and carbon-nitrogen compounds which are primarily made by living plants or derived from fossil fuels, such as oil deposits. These are limited and when consumed, use O_2 and produce CO_2. Since about 1825 or for about 140 years, we have burned fossil fuels (coal, oil, and natural gas) producing more CO_2 than plants convert to carbohydrates. Since 1930 the rate of increase of CO_2 in the atmosphere has paralleled the rate of production of automobiles, the population increase, or the electric power production. The increased CO_2 produces the so-called "greenhouse effect." That is, the sun's light hits the earth

The land with growing green plants plus sunlight constitutes the greatest chemical manufacturing plant in the world.

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and lower wave-lengths are reflected. CO_2 has the ability to absorb these, causing the temperature to increase which in turn causes the earth's temperature to increase. This may actually have a beneficial effect on the photosynthetic process. It is well known that slight increases in temperature cause increased biological activity which should result in greater plant growth and thus production of more carbohydrates. But it may also cause the ice cap at the poles to melt and flood many of the major sea coast cities of the world.

These observations about photosynthesis, the carbon dioxide cycle, increases of atmospheric carbon dioxide, and its effect on the earth's temperature are factors of concern in studies of the environment. Many popular lecturers state them and their effects as proven facts. I feel strongly that, as teachers, we must carefully separate the facts from speculation. I think it quite appropriate to study any of the implications, but the students should understand the photosynthesis cycle, the carbon dioxide cycle, and the thermodynamical relationship which states that the rate of a biological reaction doubles with each ten degree increase in temperature. The environmental implications should be posed as questions and problems to be studied. It is quite all right for Mr. Arthur Godfrey and other popular lecturers to make any statements they wish. Their purpose is to alert listeners to an awareness of their environment. It is our duty to teach students, to get them interested in asking questions and finding correct answers. A concern for environmental quality provides many opportunities for individual and group projects which science students can do.

It is our duty to teach students, to get them interested in asking questions and finding correct answers. A concern for environmental quality provides many opportunities for individual and group projects which science students can do.

The photosynthesis process uses the sun's energy to produce oxygen and consume carbon dioxide. Man's pollution and modification of the environment could effect the efficiency of this process. It is well known that smelters, coal, gas, or oil power plants and especially automobiles, emit tremendous amounts of particulate matter into the atmosphere. These particulates produce atmosphere turbidity,

haze, smoke or smog. Such turbidity reduces the amount of sunlight which reaches the earth's surface due to the reflection from the particles -- this will reduce the global temperature. It has been estimated that unless effective methods are found to reduce particulate emission into the air the turbidity by 1985 (15 years from now) will be such that the effective sunlight reaching the earth will be cut by 50%. This would cut food production by plants 50% or more in the temperate zone of the world. It might be much more than 50% where the growing season between late and early frosts barely permits the maturation and ripening of plants or fruits. Thus, even if the population could be held at the present level, air pollution must be curbed to avoid massive starvation in the world. Since the population growth cannot be stopped abruptly and since air pollution will get worse before it gets better, it will be necessary to keep as many trees as possible photosynthesizing and the maximum area of the land green with crops, grasses, ornamental shrubs, and trees. Every possible piece of land will have to produce food to avoid wholesale starvation. These observations indicate that every possible effort must be made to reduce the use of fertile productive land for freeways, homesites and roadways. The need of paper and lumber should not dictate the cutting of a tree. There are substitutes for paper. Brick, stone, glass or metals can be used in place of lumber. Paper uses could be greatly reduced.

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Just how much do we know about all of these implications? Again many questions can and should be asked. We must ask our students about the effect of increased levels of carbon dioxide in the atmosphere. What will happen if the temperature of the earth increases? Will the polar ice caps melt and raise the sea level? Will it flood the coastal cities? Or will the warmer waters increase the humidity in the atmosphere and cause much more rain and snowfall? Will the greater snowfall increase the ice caps? How much ice is sitting at the poles? Will there be another great flood, or another ice age? Will the increased

There are many more questions that can be asked, but these suffice to illustrate that environmental studies can form the basis for science instruction.

temperature accelerate photosynthesis and will this remove more carbon dioxide then is being produced? How fast will any of these effects occur? How much time will be required to detect trends and their reversal? Can the atmosphere continue to hold more particulates in suspension? If so how much? Is it possible that the haze could get so thick that the amount of sunlight striking the earth would be reduced sufficiently to prevent ripening of grains and fruits, especially in the productive temperate zones with relatively short growing seasons? What plants are the most efficient photosynthesizers? What size tree is equal to how many square feet of soybeans? Does it make sense to keep large acreage in fallow? There are many more questions that can be asked, but these suffice to illustrate that environmental studies can form the basis for science instruction.

I think every citizen should know what is happening to all life on this planet, and to us, the human race. Every elementary school child should know about the environment and the interrelationships operating in it. Every high school student should know and understand the laws of nature, the biological and physical aspects of ecology, well enough to know the options available.

Every high school student should know and understand the laws of nature, the biological and physical aspects of ecology, well enough to know the options available.

Option No. 1 - Accept the fundamental principle of population ecology and let the human race go through typical population cycles. If this is the choice, then the human population is rapidly reaching the upper limit and within 50 years some major catastrophy such as massive starvation, a global nuclear war caused by over-crowding frustrations, nuclear power accidents, or some form of plague will virtually wipe out all life and we will gradually start over.

Since this option represents a defeatist, benign indifference, it is not acceptable. If, by default, this option were elected by the people of the world, educators would have to take the blame. It is our responsibility to educate all people to know that they can elect more humanitarian options. Arnold Toynbee, distinguished world

historian, has pointed out that 19 of the world's great civilizations died. They died without knowing the reasons. If this civilization dies, it will not be because the reasons are not known, but it will be because we didn't care or because we didn't inform enough people to care!

If this civilization dies, it will not be because the reasons are not known, but it will be because we didn't care or because we didn't inform enough people to care!

Option No. 2 - Check the population explosion. This will take super convincing educational programs. Social, religious, and moral beliefs will have to be adjusted so as to maintain this civilization. Many more individuals must be soundly educated in the laws of nature. Journalists, broadcasting announcers, state and national legislators, and ministers must understand that scientific knowledge can help; that more scientific knowledge is good. They must also appreciate the social consequences of technological progress for the intensification of production.

Social, religious, and moral beliefs will have to be adjusted so as to maintain this civilization.

These are the only options. If we want our children and their children to have a livable world in which to survive, we are faced with certain mandates.

Mandate #1 - Stop the increase of the world's population as indicated in option 2.

Mandate #2 - Immediate and complete dedication to the prevention of further pollution of the air and water and the adoption of a drastic conservation program that will put every square mile of the earth's surface into photosynthetic production. Every individual will have to do his part--not only industry and government. This will only be possible through extensive solid education and not through hysteria of gloom and doom. It will require a willingness to support the cost to do it.

This will only be possible through extensive solid education and not through hysteria of gloom and doom.

Mandate #2 will require the complete elimination of the high compression, high temperature internal combustion engine. Only clear legislative action and enforcement will bring this about. It should be pointed out that this is possible, because adequate alternative

engines have been developed. However, until such alternatives are avai ble to the public, every individual should know that he can do his t immediately by driving only low compression, l w horsepower and speed automobiles. Walking whenever possible; organizing car pool o reduce the number of cars; using public transportation; and by fo egoing the pleasures of suburban living with a move toward more residential living in the central city within walking distance of the place of work are some actions we can all take now.

Paper consumption should be drastically curtailed. Disposable paper products should be abandoned, because first, they consume essential trees and then disposal of once used disposable items creates land and air pollution problems. New construction should be restricted as much as possible, to long-lasting, non-wood materials, such as stone, concrete, glass, and metal. Every high school student and every adult citizen of the United States should know that each adult and child in the United States accounts for 35 times as much pollution as one individual in India and 3 to 4 times as much as a person in West Germany. West Germany is as highly industrialized as the United States and has a comparable standard of living. The difference can be explained on the basis of number of automobiles, horsepower per auto, amount of packaging of consumer goods, extent of disposable items, such as bottle caps, paper or plastic cups, durability of home construction, volume of mail advertising, etc. We must stop the unsolicited broad scale advertising and the unnecessary and excessive use of paper in advertising. Could we not find ways of doing this by radio and TV without using trees for paper and without creating a disposal problem?

Every high school student and every adult citizen of the United States should know that each adult and child in the United States accounts for 35 times as much pollution as one individual in India and 3 to 4 times as much as a person in West Germany.

These examples of what can be done immediately by individuals should suffice to illustrate that education, or an information program, could do a great deal toward slowing down the further deterioriation of our environment.

Mandate #3 - Develop an educational program to inform all citizens of the importance of understanding the erosion of the environment. This should encompass elementary, junior high school, high school, college, and the general public.

Develop an educational program to inform all citizens of the importance of understanding the erosion of the environment. This should encompass elementary, junior high school, high school, college, and the general public.

Each level of education has an opportunity and distinct responsibility. I think education concerned with the environment and the individual's role in maintaining a livable world can provide some interesting and effective ways of evaluating programs. I would like to suggest that evaluation and testing specialists develop student and citizen polls to be administered before programs are launched to determine the level of basic knowledge about population ecology, environmental principles and interrelationships, pollution, and methods of curtailing further pollution. The polls should be repeated after certain programs are completed to determine the effectiveness of the education.

Regardless of how effective, we must try to make it more effective. The responsibility is very great; the needed understanding meager, and the amount of solid information when taken as a whole is very, very slight indeed. To quote R.G. Gustavson from a paper in the Proceedings of the 1958 National Conference on Air Pollution, "You feel that you a are somewhat in the position of a cowboy who is looking at the Grand Canyon. Somebody asked, 'How large is it?' The cowboy said, 'I don't know, but it's a hell of a big hole.'" I think that about describes the size of the hole in our understanding of the environment and the magnitude of the challenge facing science education.

The responsibility is very great; the needed understanding meager, and the amount of solid information when taken as a whole is very, very slight indeed.

ENVIRONMENTAL EDUCATION AS LIBERATION

Donald Stotler

The organisms most fit to survive are apparently those most nearly organized for reorganization in terms of problems as they arise.

It seems likely that within ten years the curriculum fabric at all levels will be largely woven from the woof of resources and the warp of population; for the fittest organism is not necessarily the one that is becoming dominant the fastest. The organisms most fit to survive are apparently those most nearly organized for reorganization in terms of problems as they arise. This kind of adaptivity human society does not now have but such could be developed.

In order to be continuously organized for reorganization there must be a continuous interaction between the topia (existing society) and utopias (possible ideal societies). This topia - utopia interaction was suggested by Karl Mannheim in his book Ideology and Utopia. Such a curriculum would exist to involve all learners in the problems within the existing framework of society while at the same time encouraging learners to look at topian problems afresh - to look at utopian alternatives.

While it is generally believed that writers about utopias are impractical, Howard Ozman in his book Utopias and Education points out that "a review of even such a limited amount of utopian writing as presented in this anthology will serve to show the falsity of this belief." It was Anatole France who pointed out that, "Without the utopias of other times, men would still live in caves, miserable and naked."

Today's topia on planet earth is described all too clearly by an anonymous writer:

Dr. Donald W. Stotler, Supervisor of Science for the Portland Public Schools, Portland, Oregon.

It seems incredible, but the world's average man represents two-thirds of mankind. Here is his picture.

He lives in a hut.

He cannot read or write.

His energy is sapped by disease.

He labors fifteen hours a day.

He works on land he does not own.

He and his family are always hungry.

He will die young.

But he still has hope!

Hope lies in education which can liberate mankind from the malfunction caused by disease, the malnutrition caused by starvation, the maltreatment caused by injustice and the maladjustment caused by poor self-learning skill. The crux of the matter is the last named, the self-learning skill, for he who knows how to bring about change in himself and society by positive means will tend to do so - after all it gives him the greatest reward. He who does not know how to act positively will tend to swing the pendulum to the negative end in order to at least be recognized as an individual. The man who assassinated President Kennedy demonstrated this all too well.

The crux of the matter is the last named, the self-learning skill, for he who knows how to bring about change in himself and society by positive means will tend to do so . . .

Furthermore violence can also ensue when those who know how to bring about self-learning and social progress are continuously thwarted. It has been wisely stated that when change becomes impossible revolution becomes inevitable.

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Utopian futures need not be born in complete packages, in fact they are usually born a piece at a time. This is why a topia-utopia thrust is feasible. Two examples may illustrate the point:

1. The United Nations Food and Agricultural organization (FAO) has now published - after five years of work and the expenditure of six million dollars - a proposal entitled "Provisional Indicative World Plan for Agricultural Development" (IWP). The proposal, which weighs

five pounds, is the first long-range strategy for bringing the food - population equation into balance. It projects that this can be done between 1975 and 1985 if the plan is implemented.

...Eastlund and Gough, who played with the utopian idea of having plasma from a thermonuclear reactor in the year 2000 dispose of solid wastes by reducing them to their chemical elements.

2. The March 7, 1970, issue of Science News presents the case of two scientists, Eastlund and Gough, who played with the utopian idea of having plasma from a thermonuclear reactor in the year 2000 dispose of solid wastes by reducing them to their chemical elements. The system would not pollute the air, would not leave behind any ashes to be dumped and would provide valuable salvage of minerals now being lost.

They figured that by the year 2000 the U.S. alone will have to dispose of 400 million tons of solid waste per year. There isn't enough land to bury the wastes and the ocean would be polluted if it were used as a disposal unit. To burn it would put 400 million tons of CO_2 in the atmosphere per year. They calculated that not only could most of the garbage be disposed of by plasma but that it could be a free ride from the electrical system generated by the thermonuclear plants that should be in operation by the year 2000. The natural plasma leakage could be so directed as to dispose of the garbage!

The future is not hopeless unless we lose hope that problems can be solved by society and do not educate accordingly.

The future is not hopeless unless we lose hope that problems can be solved by society and do not educate accordingly. How can this be done?

Education for What?

Research is the process of increasing man's known alternatives; education is the process of utilizing man's known alternatives; and recreation is the process of involvement in diversionary experience.

The history of man is written in the process of increasing and testing his environmental options. The endless frontiers are research, education and recreation. Research is the process of increasing man's known alternatives; education is the process of utilizing man's known alternatives; and recreation is the process of involvement in diversionary experience.

If the goal of education (like the process of history) were to generate, explore and test alternatives with the expectation that as

a result value systems will evolve and knowledge systems grow, how would the environment be organized? The free enterprise system offers some guidance here.

In former times clerks in stores stood behind a counter with a grid of saleable items behind them. The consumer could not move behind the counter and if he inquired about an item the clerk described it or, at best, let the consumer examine it before its purchase. Nowadays items are placed out where the consumer is and he is actually enticed to handle the merchandise. The clerk is there to consult and help when requested by the consumer. Moreover the supermarket concept makes items easily accessible that used to require visits to separate stores. Modern stores are not run for the convenience of the employees but the consumer - the user.

Were learners presented the same opportunity the teacher would move out from behind the lecture - demonstration table, unlock the merchandise and make it easily accessible.

Were learners presented the same opportunity the teacher would move out from behind the lecture - demonstration table, unlock the merchandise and make it easily accessible. He also would be very accessible as a helper when his help was needed - which would be frequent in this "we're in it together" setup. Some abuse might occur, as with stores, but the increased "sales" would more than compensate. National leaders such as Jerrold Zacharias at the Educational Research Center of MIT and John Thompson of the NSF funded Earth Science Curriculum Project in Boulder, Colorado, are experimenting with such modes of education with impressive preliminary success.

...separate disciplines are merely convenient ways to store knowledge after the fact.

If we programmed learning environments rather than learners we would be able to develop a supermarket curriculum wherein the separate disciplines would be merged simply because life is a multi-discipline - separate disciplines are merely convenient ways to store knowledge after the fact. In a supermarket curriculum, what would happen to those things that we feel compelled to teach formally "for the child's own good"?

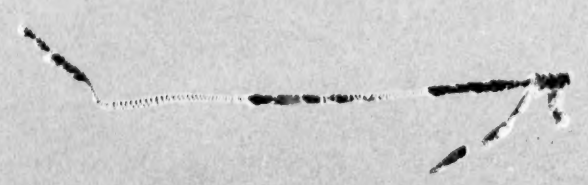
I feel strongly that <u>anything that must be taught formally can be automated</u>. The functions which we share with animals such as storage of data, sorting of data and retrieval of data should be automated. This should be made easily and directly available to the learner upon request as part of his supermarket environment. If these functions were automated, about 80% of our traditional curriculum could go into computer storage. The additional time thus provided would enable the learner to work freely with people and materials in self-learning.

Self-Learning

If we stimulate environmental education by programming stimulating environments for learners in which they are liberated to self-learn we may expect the learner to grow in his ability to interact and react with:

Dr. Bentley Glass has stated a goal of science for our open-ended era that could open many vistas, namely that science is primarily <u>to do</u> rather than <u>to know</u>.

1. <u>Nature</u>. Dr. Bentley Glass has stated a goal of science for our open-ended era that could open many vistas, namely that science is primarily <u>to do</u> rather than <u>to know</u>. The present new science curricula have far too little problem seeking and far too much concern with closure upon pre-stated concepts. The enrollees in these approaches may be improving in knowledge and the solution of rather specifically staged problems but it is doubtful if they are making great gains in the essence of research - getting the research area formulated. Why not devise open-ended programs where learners are programmed by the environment rather than by a book or teacher (the environment may be an enriched classroom, a slum area or an outdoor center) and then let learners formulate their own problems and make their own value judgments and then revise both in terms of feedback from their experiences.



...let learners formulate their own problems and make their own value judgments..

2. People. The present new curricula may involve grouping but it is largely done by the teacher. In contrast a basic skill in a modern research lab is that of working by oneself when it seems more effective, teaming when it seems necessary, as when specialists in other disciplines are needed, and then ungrouping. This can only be learned by actual experience in real situations initiated by learners.

3. Records. The most damaging practice in education in my opinion is that of forcing a class to lock-step through the same material in a linear sequence. Most of us suffer from the Gutenberg Bible complex, in which anything that isn't stapled together in chronological sequence is suspect, and therefore this practice continues virtually unchallenged. Youth is beginning to revolt against such impersonal educational practices - we can either bend or break.

Most of us suffer from the Gutenberg Bible complex,...

Youth is beginning to revolt against such impersonal educational practices...

The computer offers the greatest hope for permitting learning to become individualized. It should take over the functions we share with animals - storing, sorting and retrieving - thus liberating teachers and learners to interact in more natural and human ways. Anything which must be taught formally can and should be automated - made easily available as the learner develops the need.

Anything which must be taught formally can and should be automated...

The computer should be used as a bank to which teachers and students communicate through the use of the electric typewriter and cathode ray tube combination. This is not a teaching machine service so much as a mechanized resource consultant. It would suggest suitable curriculum activities for a

class or small group; recommend "ball park" sets of books, equipment and supplies; record student data; provide lists of resource speakers; and suggest places for field trips in terms of specific learning situations.

There is no apparent reason that curriculum which is almost infinitely branching rather than linear cannot be generated in time and prove to be far more personalized and effective. Considerable work in this direction has already been done here in Portland in science education with the (TAG) Teachers Automated Guide program.

...research scientists are not at first proficient at asking the computer the really pertinent questions.

The main problem, if the computer is used as a vast resource to which almost any type of question can profitably be put, is whether or not users can even ask appropriate questions. Some experience shows that even research scientists are not at first proficient at asking the computer the really pertinent questions. This too must be learned by experience.

4. Values. If the basic goal of science is to do then alternatives must be sorted and values become more focal. In this way science may well earn the title of the "new humanism."

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Also cannot curriculum be devised where values inherent in process (such as honesty, idea sharing and humaneness) are learned without lecture but simply because they pay off? Cannot field trips to an outdoor area be used to do more than, say, to study the ecology of the spot? Why not let students reason out the conditions under which they would or would not gather animal specimens, pick flowers, gather leaves, or walk on the grass? This would be far superior to having the world covered with general

signs - "Don't pick flowers", "Don't -- ad infinitum". Science processes should generate in each learner his own help-hurt criteria as part of its modern role.

There is a need for a Golden Rule for humaneness. The fact that the idea of "treating other people as you would be treated" arose independently in several different cultures attests pragmatically to its usefulness in the human arena. "Reverence for life" extends the idea of the treating of all life as you would be treated. However, what of such factors as water and air pollution?

A Golden Rule involving the whole environment is needed. Since the observer-observed interaction lies at the heart of modern relativity theory, it may offer a clue. Since productivity in ideas and materials is perhaps the emerging value as we look to the 21st century, it should also be considered. Productivity in this sense is the process of creating new alternatives.

In these terms we may postulate a new Golden Rule - the productivity interaction. It states that at each decision point the observer acts in such a way that both he and the observed are more productive. An illustration would be a camper who left the campsite a better place than he found it. He would have been renewed and made more productive by the camp experience, and in the process he would have made the campsite a more productive site for others.

It states that at each decision point the observer acts in such a way that both he and the observed are more productive.

An important part of environment is aesthetics. Studies show that color, texture, and music affect morale and the desire to learn. The modern research laboratory has modern architecture, varied and colorful art, rugs where feasible, comfortable furniture, varied lighting, modern libraries, and varied music made accessible. One of the sources of the

unhuman image of the scientist is the traditional dungeon-like laboratory environs. Why should not the environment of the next round of revised curriculum reflect the modern research lab? Why shouldn't the learner go even further and be responsible for creating and sustaining aesthetic environs? This would be a practical part of science as the new humanism - to not only learn but to be responsible for sustaining appropriate environs for further learning.

Why shouldn't the learner go even further and be responsible for creating and sustaining aesthetic environs?

All observers must be provided continuous, convenient lifelong opportunities to self-educate and increase in productivity - all this while being a mobile part of a highly mobile population. Moreover, the environment - especially man's instituions - must be highly flexible and subject to productive change. In a sense the observer can only be free to the extent that the observed is free; man's freedom consists, in the words of Robert Frost of "lying loose in the harness."

...bureau - centered plan of education has become as elaborate as Ptolemy's earth-centered plan of the solar system...

Certainly our present bureau - centered plan of education has become as elaborate as Ptolemy's earth-centered plan of the solar system had become 600 years ago. Regretfully, it is being protected in much the same way. Each time a new weakness was found in the Ptolemic system, great energy was expended to correct the weakness by inventing a new epicycle, rather than by permitting the basic theory to be challenged.

We have been responding in a similar fashion. When the discovery of a weakness in our educative maze is isolated, great energy is expended to correct the weakness by inventing a new "epicycle" rather than by challenging the basic theory. We now have so many epicycles (textbooks, grades, departments, groups, remedials, etc.) that it is no wonder that many people feel that we are at best making circuitous progress. It is time to try a more simplified version of education such as helping the learner explore multitudes of indoor and outdoor environments with the assistance of experts and automation upon request.

ENVIRONMENTAL PROBLEMS AND EDUCATION

(Transcribed from Tape)

Harry Kramer

It is a great comfort to me to have the opportunity to be with you this morning. I have no intention of making an address. I want to share a few thoughts with you. I do this because I think that the atmosphere is very crowded with speeches about the environment. I have listened to a lot of them; in fact I turned myself from the television a few minutes ago because I found that the "Today" show is hooked on "environment" in spite of the startling announcement made by the President last night. They got by that very quickly, and then went to a round table discussion talking about "environment" and then turned to what happened last week, that is that they would like to make this a permanent fixture on their program in some form. Too, I would like to pick up one point before I start recounting an experience for you. I would challenge a remark or two that Mr. Cannon made - a very critical one, I think. The choice is not between having a polluted environment and having industry. You know some of us now have had to live our lives in this kind of battle. That old myth should have been put to rest a long time ago. This is not the choice. In fact when remarks are made like this, often they are not talking about man and environment they are talking about some aspect of it perhaps something about aesthetics. You know for too long we have regarded the problem of pollution, the problem of man and his environment, as being something that is nice, maybe just a matter of us opting for it. It's not that at all.

The choice is not between having a polluted environment and having industry.

Dr. Harry Kramer, Director of the Office of Manpower Development, National Air Pollution Control Administration, in Research Triangle Park, North Carolina.

This affects our health and we invest vast amounts of our resources to protect our health. The environment we find every day is more and more critical to the quality of health we enjoy. The choice is not plus or minus, or black or white. Too often when we talk about cost we have adopted the custom largely of summing up. In other words we say it's going to cost the steel industry $100,000,000 to install smoke percipitators in this particular region. This sounds like a vast amount of money, but what we really want to know is what's it going to cost us? To you or me it might mean 4 or 5 cents on our bill. But I think that we have to get these things ordered so that we know exactly what we're talking about in terms of cost. And my point again is that I don't think the choice is between pollution and a healthful economy. I don't think we're going to have a healthful economy if we don't have a healthful environment.

I don't think we're going to have a healthful economy if we don't have a healthful environment.

Sure, everybody is interested in environment. And truly, I think they're very sincerely interested. There's tremendous potential to accept change and to correct and solve the problems that we face. Last November we had a workshop for 100 students from the professions in Washington; these people came from all over the country, from positions such as internships, architects, lawyers, scientists of all kinds, engineers and nurses. The meeting was done in an unstructured way. This became a very inspiring kind of thing. Subsequent to that meeting I've heard from many of the people who attended who have done remarkable things by themselves initiating programs and activities of various types. That meeting had no other goal than to bring these students together and allow them to become acquainted with and to challenge resource people. This inspired an idea that we pursued within the last six weeks. We have put together three more workshops of similar nature but with this difference: we chose to have only 1/3 of the population made up of graduate students and the other 2/3's undergraduates. There were good resource people and no structure to the

meeting to allow them to arrange it as they saw fit. We made this kind of arrangement because in the back of our mind was the question "What would happen if the opportunity was provided for a group of interested students from a region to get together, to become acquainted, to form teams and to work on problems that they thought they could work on productively?" One of these was in Southern California, one in the Gulf area, and the third in the New York City area. We offered three suggestions for discussion:

1) How do you view yourself in this environmental problem today? Have you ever considered a career in this area? Would it be a long or short-term career?
2) Truly, the environmental problem can't be sloughed off on regulatory agencies, universities or governors. The problem belongs to all of us and we must all share in its burden and in its solution. We all have responsibilities as citizens. How do you view your role in this? Do you feel any responsibility? What would you do, can you do, will you do?
3) I don't think anyone would deny that all levels of education are involved from post doctoral down to kindergarten. We have an obligation to ourselves and to our environment to have a much better, clearer, definitive understanding of our relationship with it.

The problem belongs to all of us.

These ideas were not posed as rigid requirements for their consideration but they were simply suggested thoughts they could consider.

Very interestingly many, many of us spent parts of each day talking with groups about careers, types of careers, careers at all levels. There was great interest in this. The dominant interest was the interest as a citizen. "What can I do?" Already many types of organizations have taken form to help them over that first hump. The assistance of the local, regional and national TV agencies was

But what struck me was the almost total disregard for the problems that we face in the education field.

invaluable. But what struck me was the almost total disregard for the problems that we face in the education field. This didn't appear to attract any interest or action during these workshops.

It is upon this issue that I would like to share a thought or two with you, because it seems to me, that this is certainly one of the universals that we must all attune to. We must begin very early in our education processes. And really there's a possibility of presenting some of these issues in a way we're hoping to do in the universities. Here we can get away from just looking at it in a narrow, departmental or disciplinary point of view with which some of us have struggled for the last ten years or so attempting to make a change so that we really look at the problems in all their dimensions. It struck me that we've done so little with this.

We must begin very early in our education processes.

I recall back about the year 1950 or thereabouts that an idea appeared, "Why don't we develop some high school science experiments to be used nationally?" We first chose four or five good science teachers because of certain qualities we thought they possessed; a chemistry teacher, physics teacher, general science teacher, and biology teacher. We took them on a tour of our center which lasted a couple of days to give them enough acquaintance with ongoing research projects. This would enable them to make a decision as to which one of these they might relate to. Each one had to make a choice. Then over the next month or so they became very, very closely related with the research team on that particular project and began to understand the issues involved and all the approaches that were being made, and the kinds of techniques that were being employed. Then each one of them wrote a high school science experiment. I think that's the most popular efforts I ever saw. I think it cost us $600 to do the whole job. I'm told that hundreds of thousands of these experiments were distributed on request. So again very often it's not a matter of high funding, it's the matter of interest and the idea

I think that's the most popular efforts I ever saw.

We face a great need because there's a lot of misinformation, incomplete information and bad information being circulated. The environmental problem is going to be with us for awhile. I don't particularly attune to the doom sayers; I think, if anything, the first chance to win has been afforded us. A remarkable departure from things of the past has occurred when the best we could hope for was a holding operation with an occasional forum or some oratory.

The environmental problem is going to be with us for awhile.

That allusion made to these paper mills, you know paper mills are not just in Oregon and Washington, they're scattered around the country, and for a number of decades they've been one of our most agile evaders of pollution control. They felt their technical advancements protected them from onslaughts by the pollution they had created. The point is that some of us feel there is too much paper being made today. This contributes to the social litter that you and I make and there is something I think we can do. Even in the beautiful area of North Carolina and around Research Triangle you can't move along any road that isn't absolutely littered on each side with beer cans and pop bottles. And I don't think they all come from the oldsters. I think the students have made their generous contribution. I like to bring up the point in my seminars that there is an awful lot of litter that appears right on the campus. Another point is that it is going to cost the paper plant something to eliminate the problems of water pollution and air pollution. Now I can talk about costs and I can talk about methods but it really comes down to the power to bring these changes about - ultimately scientific information and good will on our part won't do this. I thought an excellent statement was made in the last couple of weeks by William May who is the President of American Can. When he was asked, "Now why don't you stop putting this stuff in cans? You know you're littering up the whole environment." He said, "It's impossible for me to do that! The judgment has to be made someplace else." It's true. This is a political decision. We must create the standards that would allow

...there is something I think we can do.

This is a political decision.

competition to endure and not command that one industry be a trail-blazer and adopt practices that would render it non-competitive and therefore put it out of business.

I don't particularly agree with the former speaker on one other issue. I don't think solid waste is the most critical problem. It is the most expensive one--you spend more money for recent return--but it is a problem largely of transportation. A colleague said to me recently, "Harry, this isn't a problem of technology--it's a problem of transport." One can see that it really is. Whatever waste we produce must be collected. It shouldn't be collected in an archaic manner. Certainly, one type has been the use of the garbage disposal unit. You know when that was introduced we were told that all of our treatment plants were going to be totally overloaded, unable to handle this organic load. And truly, most of our plants, at least 99% of them, are constructed to handle that kind of waste. They are not able to handle some of our most recent kinds of wastes. So we do have a problem of transport. New York City is an excellent example of a breakdown on the technology side because they don't know what to do with anything if they can't put it in the ocean. The problem of sludge from sewage treatment plants, the problem of solid refuse, and the problem of what they collect as solids from their air control devices -- where do they put it? A phrase which appeared in a National Academy document several years ago on waste management and control stated that there is no way any longer we can throw things away. This becomes clearer and clearer every day. We do need new technology in this field but for goodness sake let's try to apply some of the technology that we do have.

...there is no way any longer we can throw things away.

This is not a simple matter. After a decade or two of struggle it wasn't until 1948 that the first federal water pollution control act was passed. Yet, we had had water pollution since practically the turn of the century in our country. As soon as we began to put

people together in large communities and began to build industries we had water pollution. But it was a tremendous struggle against tremendous odds to try to get that first water pollution control act passed. That was truly a milestone. Yet, today everywhere the struggle is still going on to try to establish standards and to enforce the law. That's a pretty difficult task.

The first air pollution act was passed in 1963 which has been modified and perhaps will be modified again. Let me give you some insight into the chain of events one must go through in order to control the quality of the air and also the time scales involved. In the first phase, the Secretary of HEW, in consultation with the government of a state, must agree on the boundaries of the so-called air quality control regions that exist within a state. Ninety days must be provided for consultation with the government, governor and others to agree on this boundary. Subsequent to this there is a requirement on HEW to publish two documents on every standard that is going to be proposed, one a so-called criteria document. This represents a summation of all of the relevant knowledge regarding the effect of this particular contaminant to man, plants and animals. For a while it was conceived that this would be very general information and other judgment would be made later. Subsequent to this early decision it was later decided that a criteria number would be announced in this document. In other words, this would be the suggested number, the number that would not be exceeded unless you were going to encounter adverse effects; i.e., damage to animals, plants and man. Coupled with this criterion document there must be another document that shows in detail and describes in detail the technology that is available to control the pollution that would enable you to meet this criterion. Now these must be published whenever a standard is to be proposed. That is the starting point. Only two of those have been published until a week or two ago; these involve sulphur oxides and the particulates.

These are the pollutants that come largely from the power plants that burn fossil fuels. Now, after these standards are introduced the governor has 180 days to decide whether or not he will accept the responsibility for setting standards. Public hearings are required during this period to study the standards. Subsequent to this, there is another 180 day period where the requirement is for development of an implementation plan. In essence, the implementation plan outlines how you are going to get from where you are to the standard level. So it embodies the strategies that are going to be employed; the meteorological information relevant to the degree of contamination that exists in the area today, what kinds of shutdown plans you have if you are getting into a bad meteorological condition. For example, are you going to shut down all the power industries? are you going to switch to other fuel - low-contaminant fuel - and so on. What kind of resources are you going to bring to bear? What kind of money are you budgeting for this purpose? What kinds of staffs have you acquired to meet these needs? When new substances or standards are introduced you have to go through this whole sequence all over again. It will be on an individual basis for each air quality control region involving the governor of each state in which this region is located. So, it is going to be a very lengthy process.

So, it is going to be a very lengthy process.

On February 15, the President announced his intention of proposing air quality standards and National emission standards. These standards would be the maximum level that would be permitted nationally and states could have standards that were better than these if they so desire. Now if this finds its way into legislation it will shorten the gap very, very much and speed up the battle of control and quality of the air.

Now, I want to close my circle here just a bit. I relate this to you to show the complexity of actions required to get from where we are to where we want to be. Years ago we used to have hearings on the water pollution issue. We would have a small number of our staff;

the hearing examiner and the legal staff of industry made up the body for the hearing. There was no one interested in making presentations for the public at those hearings. This has changed tremendously: this is why the standards now being adopted are consistent with the criterion levels. At one hearing for example, in a major midwestern city which has a rather significant air pollution problem, - what major city doesn't- , the suggestions by the state were that they have initial standards that would exceed the criterion levels by about some twenty-five to thirty per cent. At the hearing, however, some 2,000 people appeared each of two days and the standards were brought right back down to criterion level. This had impact on the standards that are going to be set for the entire state. So the individual is of tremendous importance in determining the quality of the air we breathe under the legislation that now exists.

So the individual is of tremendous importance in determining the quality of the air we breathe...

Let me tell you one other thing that I think you should be interested in. I think that we have not dedicated our efforts, our intelligence and our thoughts adequately to the kind of problems we face. We must have new kinds of enterprises in research and we must have new kinds of people produced who are capable of working in these problem-oriented areas. Let's take a specific example. The State of Oregon will probably have a man called the State Sanitary Engineer. Usually, he is located in the State Health Department, buried under eschelons and will have some kind of a responsibility across the board. What was his education? Well, if he is in the age group I think he is, he was a Civil Engineer who took a few hours of water supply or water pollution control in the senior year of his educational experience. Most of them have gone on for perhaps one year of graduate training. But it was all technically oriented. These people are then put into a framework where they have to be keenly attuned to political problems.

...we must have new kinds of people produced who are capable of working in these problem-oriented areas.

The new breed must be very deeply aware of the political and legal significance of the action they are taking, highly sensitive to the

economic aspects of the actions that they wish to bring about, and must have high ability on the social scene to understand people, to relate to people, to communicate with people. So what I am saying with one exception in one state is that every one of these people had to learn these skills over many, many years of hard knocks. What has been pleaded for and what I am deeply dedicated to is the concept that we need people who comprehend problems, who are interested in problems, interested in solving problems and I don't mean that this is a person who takes a new course in everything.

...I don't mean that this is a person who takes a new course in everything.

The significance of every piece required to solve this problem must be there. Interdisciplinary action whether it comes through the academic framework or comes naturally out of the real world is absolutely essential to the control of the environment. My thesis is that we must find even better ways of escaping from the departmental bonds in universities to accomplish this, to develop people who have these capabilities. Now if I were in a high school today, say I was a chemistry teacher. I would like to get together with my counterparts in the other sciences, particularly, and some of the social areas and perhaps form a seminar group to look at the problem where we live. We would do enough homework to really comprehend these problems and then plan some actions to define and to measure these problems. I would see coming out of this physics projects relating to meteorological aspects, the chemistry area measuring particulates and sulphur oxides. Within the social sciences the general problem of responsibility of people would be studied. Courses that relate to government control would also be a good plan. I think I would try to do it as a group not just try to do it all on my own.

Interdisciplinary action whether it comes through the academic framework or comes naturally out of the real world is absolutely essential to the control of the environment.

You know, in our own field, unlike other agencies, we never really supported anything below graduate training. We never gave undergraduates any research support. Four or five years ago a Cal Tech group sent in a proposal for an undergraduate research project. I thought it looked

very good and gave it to the appropriate people. It was funded by us initially and now I am quite sure it is funded by NSF. The kids designed this whole thing themselves. This was a monitoring, analysis, training kind of concept, very good I thought, but the reaction of the faculty was very interesting. This is something I think that would bother you a bit because I am sure this could happen anywhere. There were some faculty members who thought this was tremendous, who encouraged progress. To get it started they donated some of their personal funds to students. There were a number of other faculty members who derided the effort, saying well "they are only going to rediscover the wheel." "It's going to dilute their study efforts." A whole host of reasons were given why it shouldn't happen. But it did and I understand it had one side benefit. It introduced women to the Cal Tech campus because one of their ideas was to bring girls from Eastern universities into a summer fellowship program: some of them just stayed on. So it broke the barrier I understand.

The kids designed this whole thing themselves.

There were a number of other faculty members who derided the effort...

I would like to say in conclusion that it is not necessary to inspire students all we need to do is offer some leadership and direction.

INDUSTRY AND THE ENVIRONMENT

(Transcribed from Tape)

George Schroeder

Thank you, Mr. Chairman. I'm not sure any more just what's going to happen when I get up to the podium. I chatted with one of your members from the audience this morning that I have known for thirty-eight or some years. At the time I first knew him, my wife and I were trying to buy a home. At the present time we have a mortgage which is worrying us very badly and yet the other day at Portland State I had a continuing confrontation with a black man and he ended up by calling me a fat capitalist and worse. When I went home I expected my wife to give me a little sympathy and she said well after all the doctor says you are a little overweight. She said why did you renew the mortgage? You're a capitalist. We worry a little these days when we come before an audience.

We worry a little bit these days when we come before an audience.

Well, this morning, as I understand it, I am the representative of the capitalist group or the industry group and I'll try to present the picture from the environmental standpoint. However, I thought as an introduction I should quote from our former president Nick Boylan. I am sorry to say he has passed on since February when he gave this talk which gave me this information and we now have a new president. And I think this fact in itself has something to teach us. Industry is a fiercely competitive portion of our society and especially those that ascend to high places in industry have a tremendous amount of pressure upon them. One corporation is constantly fighting with the others in its particular field, in the perimeters that are set by state and local government, trying to maintain that very slim profit margin which allows them to continue to exist. And Nick Boylan, who I think was one of the great presidents in the United States, worked and helped Crown Zellerbach for twenty years, has now passed on right in the prime of his

Industry is a fiercely competitive portion of our society and especially those that ascend to high places have a tremendous amount of pressure upon them.

George Schroeder, Chief Forester for the Crown Zellerbach Corporation.

physical and mental capacity. I think it is largely this pressure. Nick presented this about as follows, he said that in the development of a corporation's philosophies or strategy that is adhered to, it must take conscience over society. Society is made up of the people outside of the corporation and society develops its power by its filigrating sub-systems and it continues to grow. Examples of such sub-systems are government, in all its forms, educational systems, clubs, political parties, and so on. He pointed out to us that each Crown Zellerbach employee may play a role outside his working hours quite different from the one he plays at work. In this day and age one is not apt to be closely governed by the thought processes of his employer. I think it is important also to point out that Crown Zellerbach has some 28,000 employees and some 34,000 owners. I can remember my reaction, say in 1915 - 1920, when I thought of the corporation as being represented by one man whether his name was Ford, Kennedy, or whatever. But in this day and age the corporations are by and large a people's corporation. And if you think of these 28,000 employees and 34,000 owners and the families of these people, the families who are directly involved, there are over a quarter of a million citizens in our corporation alone. Yet, there are the small businesses working for or dependent upon Crown Zellerbach for their major income. I imagine there are close to half a million souls dependent upon the slim margin the corporation is able to maintain. I give you Crown Zellerbach as an example then. We note that people involved in the large businesses in our country constitute the major portion of our population. Now as to the definition of a corporation as we think society views it. Private corporations are instruments of society. They exist at the pleasure of society. One of the major or primary responsibilities delegated to corporations by society in the United States is the economic supply of goods and services. A successful corporation must have profit. But profitability alone does

One of the major or primary responsibilities delegated to corporations by society in the United States is the economic supply of goods and services. A successful corporation must have profit.

not define the total role of the corporation. On the other hand pursuing society's goals without profitability is impossible to do at least if the corporation passes on to successors. In our profit system if the corporation is not rewarded by society by being allowed to make a profit or return, it just can't continue to exist.

To prove that the corporation is an instrument of society, about all we have to do is review the many regulations that have been forced on corporations over the past fifty years and I am sure you are aware of at least some of them--labor laws, tax laws, federal trade production regulations, and so on. We know that there will be additions to this list and it's logical that there should be. Corporations should change to fit the needs of society as time goes on. And it is very important that the rules be changed according to these changing needs in order that all the corporations may be fighting for a profit and continued life under the same rules.

Corporations should change to fit the needs of society as time goes on.

I had rather a difficult time getting through college, I used to work nine months and go to school three and it took me about eleven years. One of the things I did in order to make a little money was to work at boxing. If we hadn't had rules one of us would have died. The same thing is true of a corporation; without the rules we would very quickly kill off the corporations - the weaker of course. We of the management category in the private enterprise system need to have a strong belief in that system otherwise we will be unable to positively guide corporations through the changing conditions of the social environment to which it will be subjected. We have to have this belief to constantly and positively question its role in the ever-changing environment in which it exists. To put it bluntly we need to believe strongly in the modified, ever-changing, capitalistic system in order to put up the best fight for survival. We stated that a corporation must be profitable or it can do nothing for society. Thus it has to do more than just survive. Quite often representatives of corporations work

...without the rules we would very quickly kill off the corporations - the weaker of course.

with other members of the society in setting up these restraints, because I think the corporation must be tailored to the environment in order to live. I will be working with one of our associations in trying to work out a logical law in a particular field sometime this week.

Now a corporation does not achieve - people achieve. I think that is important to realize. Its image, as society sees it, is a reflection of management's expressed thoughts and actions. Because a corporation is a people and society makes broad generalizations, all corporations are apt to be judged by the actions of one. A corporation has power which is derived from the fact that it is an economic unit. It also has some degree of economic influence over its employees, although as I have said this is decreasing every year. It can decide to curtail, go out of business, strike, and so on. It might be fair to say that over the decade the power entrusted to managements of corporations has not always been used wisely, which makes it a little more like people. We as individuals make the same kinds of loose judgments and generally none of those loose judgments are correct. For instance we used to say in the wrestling ring that an Irishman was a tough man; well, some of them were and some of them weren't. We make these generalizations; quite often they are stupid. I had an assistant who is black, he is now lecturing at the University of Washington, and I find myself fighting my emotions time after time when someone says a black man doesn't have the capacity. I had an Indonesian son through the American Field Service who is almost black and I find myself in the same category, when he lived with us for a year. I found myself constantly trying to protect him. People are cruel in passing their judgments. This business of generalization is a pain.

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People are cruel in passing their judgments.

Now looking at corporations over the last fifty years it is easy to see why society judged. They needed some restraints. The people

The people running them didn't use their power wisely.

running them didn't always use their power wisely. It does prove that corporation actions are evolved by people and judged by people and normally all generalities are wrong. Corporations and people cannot be put into little boxes. Corporations have personalities that are reflected in the areas in which they locate and these personalities make them visible. Some are progressive and honest in their dealings, some are guilty of sharp practices and so on. Like people, they pay taxes, they're born, they grow, they die, they stagnate, they take an interest in government, education and their employees. It's amazing how often society looks at corporations with the bad word, "big business," which became and is still used as an epitaph to describe corporations, usually by politicians. Politicians who have in some manner duped all the people in the United States to believe that if business pays all the taxes somehow people won't have to pay the taxes, in spite of the fact that people buy our goods and services. In the end it is ultimately the buyer of goods and services who must pay the entire bill for all the costs including labor, development, raw materials and so on. Strangely enough people even exist at the pleasure of society also. Laws regulate our actions. These laws have been found necessary because all individuals do not live by a high moral code of values. The laws have put up many taboos and if broken there are penalties for individuals; fines, jail, perhaps ostracism from society are some of the penalties. Strangely the same things happen to corporations and often to the people who run them. There are civil penalties for the actions of the people who manage a corporation.

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Corporations must recognize and support the changing needs and desires of society and must exert a timely, positive influence to bring them about.

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When the settlers of the west were coming across the country pollution was not a problem. Open space for recreation was not a problem. Game and fish protection was not a problem. Educational

facilities, food, health care, and communicable diseases were problems. It is interesting to note that many of the things that were problems then have been reasonably well solved. Many that were not problems then are with us today. And I think "timely" is the word that should be emphasized. The fact is that society must first recognize the problem before a corporation can do much about it. And perhaps we should restate that and say that a corporation should not do much about a problem until society does recognize it.

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Now if you look back over the last few years you will realize that the problems we are now facing have been thrust upon corporations rather quickly. And the reason I say this is that if a corporation recognizes the problem and tries to do something about it without society recognizing it, then it's apt to go out of business because it's putting its money in the wrong place. And we go back to the statement that a corporation must be an economic success before it can do anything for society. Thus if it increases its costs beyond that which society is willing to pay for its goods and services by tackling problems too soon, that adds to its cost. It will be out of business in short order and will then be incapable of doing anything for society. I think you all recognize that most of the big businesses have analysts watching the other businesses in their competitive field all the time. And when they see an opening they go for him. And the other corporation will be absorbed or forced out of existence in one way or another. Man is a brutal, aggressive animal and corporations are the same. Timely and positive recognition of the time that society wants to solve a problem is important. At that point corporations should be actively and positively involved to aid in the solution. They should recognize the need and the problems it will cause. Normally this is increased cost. Are the people ready to pay more for the goods and services? It's as simple as that. We should also recognize the difference in opinion held by various institutions in society. The Sierra Club doesn't look at a forest with the same view as a lumber company or a logger member

Man is a brutal, aggressive animal and corporations are the same.

The Sierra Club doesn't look at a forest with the same view as a lumber company...

of the Industrial Woodmen of America. The Commercial Fisherman's Union doesn't look at a salmon run the same as a sports fisherman. A Teacher's Union doesn't look at the problems of education as do the members of the PTA, or as the school board might. Apparently law and order aren't viewed by many groups or individuals in the same way. We might add that society isn't always right in its decisions. I'm not sure I'm safe in making this assertion but what I am saying is that some of you are old enough to remember the Halstead Act, the law that was passed to make the country dry. The country didn't become dry because people did not want it that way. The law resulted in a spawn of corruption in law enforcement agencies, bribery of political institutions, and a development of criminal organizations in this country that we may never stamp out. Society is not always right. Also, it has many institutions that have dramatically opposed opinions on what should be done. Its corporations are one of those institutions. Corporations are run by and have in their many functions some of the finest brains in the country. It is imperative that corporations use their resources to avoid their own destruction and help solve the many changing problems of society.

Society is not always right.

It is imperative that corporations use their resources to avoid their own destruction...

Now with this background of what a corporation is, I'd like to present some results of the last meeting of the economic council of the forest products industry. Of course this is the one to which I'm closest. The following is a summary of their 1970 recommendations formulated at their January meeting.

Working from the premise that the wise use of land, air and water is essential to the future well-being of the United States, the Council concluded that industry's role is to be principally concerned with areas in which the industry can make a direct and positive contribution. The council endorsed President Nixon's call for an age of reform in environmental matters and emphasized the role of enlightened multiple-use management; management of all the nation's forest lands calling for

The council endorsed President Nixon's call for an age of reform in environmental matters...

strong and prompt action where it is needed in areas of air and water purification. The short-range recommendations included first, an evaluation of industry performance from the local to the national level in environmental areas, involving air, water and land; second, industry and company policies aimed to minimize pollution; third, formation of environmental improvement committees, nation-wide, with participation by local and state officials; fourth, participation by companies and associations in the April 22nd series of teach-ins on the environment (and we did participate); and, fifth, an immediate beginning to development and implementation of an industry program to meet our responsibilities in the environmental area.

Among the long-range recommendations were the following:

First, that the industry as a whole, and through its associations, establish strong positive and meaningful communications and dialogs with the academic community groups who have a legitimate interest in all the multiple uses of forest land.

Second, coordinate discussions within industry on exchange of technical information on all environmental questions and on communications with outside agencies on standards, regulations and research.

Third, participate in government task forces where feasible on environmental questions including those that call for cooperation by industry in the President's efforts to improve rural economies.

Fourth, examine all the public relations aspects of industry action including the possibility of opening more private land to public use and the publicizing of this availability widely; commit the time and interest of principal officers and the necessary funds to a program of action and communication in the environmental area; give strong priority to allocation of capital to pollution control recognizing that past performance has not always been adequate by today's standards and certainly not for the future; continue to expand landscape management for aesthetic values as a major element in management of forest lands for all ecological values.

...including the possibility of opening more private land to public use...

Now with that back of me and as a third step in my presentation, I would like to mention and describe some of the environmental programs of my company, Crown Zellerbach, in the Northwest. As a specific example of what industry is doing, at Camas, Washington let me cite construction in June of last year of a $15,500 magnified pulping system to replace the sulfite process. I know someone who will be very happy. He lives right across the river. New facilities expected to be fully operational by 1971 will use magnesium bi-sulfite to cook wood chips and recover and burn organic materials from the cooking process. Organic materials from the sulfite process presently are discharged to a holding lagoon and into the Columbia River under procedures approved by the Washington pollution control commission.

In another water quality control program at Camas, industrial effluent containing solvent solids is piped to a primary treatment plant which removes 95% of the pulp. The company also is working with the federal water pollution control commission on a demonstration research project to dispose of sludge. At Port Townsend, Washington a $9 million Kraft pulp recovery boiler was installed last year with air quality control devices to help control smoke, dust and odor in the area. Process water from the mill's paper machine, wood mill and Kraft mill,will be collected and pumped to the treatment plant. The clarifier or settling basin for treating the water will be 186 ft. across and approximately 12 ft. deep. Water will be held in the clarifier for several hours while the solvent materials are separated and removed. The completed system, which will bring Crown Zellerbach's investment at Port Townsend to $12 million for the improvement of air and water quality, will be capable of treating up to 19 million gallons daily. Under normal conditions the plant will treat 12 million gallons in every 24 hours, removing about 23,000 pounds of solvent.

The third project is the demonstration water quality improvement program at Lebanon, Oregon. This pulp and paper mill now in full

operation has connected with it an evaluation of an aeration lagoon technique for treatment of pulp waste. This $805,000 project which Crown Zellerbach is directing in cooperation with the Federal Water Pollution Control Administration, also seeks to develop new methods of measuring biological waste in a stream. Resulting information along with an economic study of secondary treatment processes will be made available throughout the pulp and paper industry as a means of increasing the efficiency of future waste treatment projects.

Now the company's newest mill in Oregon on the Columbia River represents an investment of approximately $110 million and is moving ever closer to its full production potential as the weeks go on, setting new production records all the way. The largest of Crown Zellerbach's capital expenditures, this pulp and paper mill is equipped with the most modern equipment available for an air and water quality control program.

Crown Zellerbach's Northwest operations also proved to be safe operations in '69 as both pulp and paper mills continually have achieved safety records. One plant for instance celebrated the achievement of one million man-hours work without an accident and the record remains unblemished in the drive for two million injury-free man-hours. The large Camas operation reached the one million man-hour safety mark for the twentieth time last October. Now, in the logging woods where I cut my teeth, the thirteen hundred employees in Crown Zellerbach's seven managed forests also reached one million man-hours work without a disabling injury until last summer, an outstanding safety accomplishment in one of the nation's most hazardous industries. I started working in the woods the summer I was 14 greasing skids and went on to what they call swamping. In 1928 I was working in the High Sierras on a job that we call sledding tongs. We ran with a 105 pound tong, literally ran with them, and there weren't many men who could. The point I want to bring out is that the change from then to now is tremendous. We

...this pulp and paper mill is equipped with the most modern equipment available for an air and water quality control program.

We used to see a dead man packed out of the woods...

used to see a dead man packed out of the woods and taken on in to camp without ever stopping our work and we used to see these things happen day after day after day. I split this finger to the bone one day and went right out and worked because jobs were few and the attitude was if a man wasn't fully efficient he got thrown out. This is a tremendous change and few people realize it.

This is a tremendous change and few people realize it.

Let me reread that. Perhaps it doesn't make the impression on you that it does on me after having gone through this, after having been a high climber and a tong slinger and a choker setter and a chaser in the woods in the old days. Thirteen hundred employees of Crown Zellerbach's seven major managed forests also reached one million man-hours work without a disabling injury. That is really something, believe me.

A major clean-up job on a lake near Reedsport, Oregon was accomplished by Crown Zellerbach crews during last summer. Piling and logs used by the company and its predecessor company, in fact there were accumulations there of at least thirty years, were moved to improve the lake's appearance, eliminate boating hazards and improve other surrounding recreational facilities.

Another interesting development which we think will help in minimizing soil disturbance in logging is a new yarding concept introduced to Northwest timber last year. One division of ours at Cathlamet, Washington now runs both a day and night logging operation using a two-man crew, "two-man crew", which can equal a conventional seven man yarding operation under which safer conditions are experienced by the two men.

Now closer to my heart, because I took my graduate work in an allied field, is what we call corridor thinning. It's a standardly developed thinning practice aimed at better controlling young timber stands and is being studied at Crown Zellerbach Corporation. Rather than spacing tree by tree in thinning, all trees within a 15 to 20 foot wide corridor up to 125 feet long are cut in a herringbone

pattern at an angle to the main tractor skid trail. The process is an attempt to fall, limb, buck and yard to get smaller ones faster and safer and more economically than can be done by conventional thinning. Findings today anticipate increased yields of up to 40% beginning with young timber. Now finely made trails like this, within a year or two, result in the crowns of the trees just about touching one another. This means that you are fully utilizing the air, the sun, the water, and the soil, which means that you are also putting out a maximum of about one and seven hundredths tons of oxygen into the air per acre each year. Now you don't do this except with young trees you understand. As a tree gets older, if you allow the tree to grow and die, the amount of carbon dioxide it gives out would balance the amount of oxygen it gives out; but, when you allow it to grow to its maximum efficiency and cut it at 60 or 80 years you save that oxygen and don't balance it with the carbon dioxide.

Also during 1969 the forestry department for the first time began growing trees in nurseries from genetically superior seed. Seedling planting or aerial seeding of reforestation areas continued to increase on Crown Zellerbach lands last year while research continued at the company's central research division. We have about 150 scientists of all sophistications and tree farms for developing faster growing species and improved future timber quality. In cooperation with the other companies in the Northwest forest industry, Crown Zellerbach is now growing some 4 million trees per year, crop planting and replacing them for use in the economy of the country. All together the company and the two or three nurseries involved put out 20 million trees per year. We see the forest land manager as a carefully trained and able practical ecologist. He has available to him biologists, chemists, game and fish management specialists, landscaping engineers, and soilculturists as consultants. He must be knowledgeable in all phases of multiple-use management. He is trained in management by objectives; objectives

We see the forest land manager as a carefully trained and able practical ecologist.

set by his superiors and the public. He is more efficient in reaching these objectives with each passing year. I am sure this is true with you in education. I know it is true in the school district with which I am concerned.

In closing I would like to re-emphasize the point that corporations are instruments of society.

In closing I would like to re-emphasize the point that corporations are instruments of society. At this time they may be paying as much as 52% of their net earnings into the federal treasury and this, you understand, is varied by congress according to the needs of our nation. We are licensed to operate by states, regulated by federal and state governments, and only make a profit in our operations when society approves of what we are doing by buying our goods enabling us to more than pay for the cost.

I do not believe that we should apologize for what we have accomplished...

In looking back on the sixty years and more that I have lived I do not believe that we should apologize for what we have accomplished in the last half century. In one generation the United States through this system has conquered or controlled diphtheria, smallpox, typhoid, polio, measles, tuberculosis and pneumonia. Transplants of live organs are becoming routine. I can vividly remember when practically every block had quarantine signs on doors of homes during the winter time and one or two of you are not too young to remember that I am sure. I can't remember seeing this sort of thing in the last several decades.

This adult generation has built more schools and hospitals than all other generations since the beginning of time.

This adult generation has built more schools and hospitals than all the other generations since the beginning of time. It has taxed itself more to bring more dignity and equality of opportunity to minority groups than has any other generation in the United States or anyplace else on the face of the globe. The radio, television, automobile, airplanes, space ships, computers and the thousands of other miracles are the gifts of today's adult generation of Americans. Private gifts to charities run into the millions each year, more than the total federal budget of just a generation ago. And through four wars the United States has used its material wealth to bind the wounds

of scores of nations around the world and this included the victors, the vanquished, and the impoverished. Without the United States undoubtedly the United Nations wouldn't exist. Although our society may be far from perfect it is the best the world has known and its leaders are dedicated to even greater accomplishments.

...it is the best the world has known...

Now in the above I am quoting directly from the publisher of the San Francisco Banner and he asks the detractors what they are doing for the betterment of the nation, and answers the question himself this way: nothing but seeking to destroy the only nation in the world still capable of giving people hope.

...seeking to destroy the only nation in the world still capable of giving people hope.

As I see it all we have to do here in the United States is decide what kind of a country, what kind of a civilization we want. If we are all willing to work at it we can secure it.

ECOLOGICAL PRINCIPLES AS A PART OF GENERAL EDUCATION

(Transcribed from Tape)

John Thomas

It's a pleasure to be here and to talk to you and I am sure that many of the things that I am going to say will have occurred to you and perhaps some of the things I will say will be in a slightly different form and perhaps will put things in a slightly different context. Some of the things I will say will not be very encouraging and if I make some slightly acid remarks occasionally I want you to know that is just the way it is.

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Now I think when we look at the problem of population and the problem of environmental deterioration and we look in general at what we have been doing in terms of teaching about our surroundings in the past, we have to realize that we have not been doing a very realistic job. Certainly the conservation textbooks that were available when I was in school gave the impression that conservation was simply a matter of contour plowing, putting in park ponds, planting roses along hedgerows, and occasionally planting trees on Arbor Day. These are all good things to do but this is a far cry from a realistic approach to our surroundings. Until eight years ago a student could go through Stanford University as an undergraduate zoology major and probably not hear about ecology to say nothing of a course in ecology. I suppose, at any rate, we can consider our teaching about the surroundings practically a failure. In other words, not too impressive. And even such courses as the Biological Sciences Curriculum Study which has done a great deal toward upgrading high school biology in many ways, I think, is far short of the mark. Not that I oppose this particular subject matter, but all too often academically oriented students have been using the blue version. This is the more molecularly oriented of those versions, so students have come to college well prepared to

...conservation was simply a matter of such things as contour plowing, putting in park ponds, planting roses along hedgerows, and occasionally planting trees on Arbor Day.

Dr. John H. Thomas, Department of Biological Science, Stanford University.

deal with more of the same. And of course BSCS does very well somewhere between the upper half and upper third of students taking high school biology. In general then, what we have been teaching students in all elementary schools, high schools, and colleges is what the biological establishment of this country has wanted taught. The biological establishment of this country has for a very long time been aiming at one goal, namely the curing of cancer. This has been, up until recently, what the thrust of American biology has been; this is where the bulk of the money has been; and this is where decisions were made. Now, in the last two years, in particular, there has been a great deal of concern about our surroundings; the problems of population, and all of the factors that go with it. This is for good reason; we are getting perilously close to the problem of simply being able to survive if things continue at the same rate and in the same direction.

The biological establishment of this country has for a very long time been aiming at one goal, namely the curing of cancer.

...we are getting perilously close to the problem of simply being able to survive...

So the words "ecology" and "environment" are being bandied around at a great rate - often in an unfortunate manner -- and we see all sorts of activities; some of them useful and some not. For instance you have all sorts of symbolic gestures such as survival marches; people marching twenty miles. I saw youngsters straggling back from one of those one day. I'm not sure it was ecologically very sound to get people out who haven't been in the habit of walking and then asking them to walk twenty miles. This is all somehow in the interest of survival. I'm not really sure some of the contests I have seen recently in California among high school children to produce some sort of art work out of waste is really anything that is going to solve our problems. Maybe all these are good symbolic gestures but they really don't get to the heart of the matter. Maybe throwing stones on college campuses is a symbolic way of protesting but it doesn't really solve the problem very well either. You know, it is apt to create another problem. Even though there has been all this attention

I sometimes get very pessimistic when I think about the job of education we have to do.

to problems of ecology and environment I am not at all sure we've won the battle yet. I sometimes get very pessimistic when I think about the job of education we have to do. I have been very impressed the last couple of days not only because of Cambodia but also because of a number of things that I have seen going on on our own campus. There are small groups of people we apparently somehow missed or failed because we cannot communicate with them anymore: they who are disrupting the entire system.

I think that there tends to be,on the part of the people in positions of authority, rather an unhealthy concept of what we must do to solve our environmental problems. Namely, the way we have solved problems in this country before is to have a vast program that takes money and men and puts them to work and soon they (the problems) will be solved. A number of times programs were instituted in this way, the atom bomb was created on the basis of a crash program; we got a man, two men on the moon simultaneously; the Salk vaccine has certain aspects of crash programs too; and I am sure we can all think of a number of others. But we're dealing, when we talk about environmental population problems, not in isolated segments of the world but essentially with the whole world. I see over and over again the attitude that we should just simply have crash programs. Let me give you an example of what I mean. The Governor of California, Mr. Reagan, last November had an environmental conference in Los Angeles. He had a thousand people come down from various parts of the state and when it was all over he said we are going to have to do something about air pollution in California, and we may even have to lose those sacred gas tax monies in order to do something about this. We may have to resort to rapid transit to solve air pollution permanently because we are going to be 50 million people in California by the turn of the century. I heard an assemblyman recently in Woodland, California say that we are going to have to get a great deal more of California's

But we're dealing, when we talk about environmental population problems, not in isolated segments of the world...

...we are going to have to do something about air pollution in California...

coastline under public ownership (Oregon is to be commended on its coastline acquisition program) because there are going to be 50 million people in California by the turn of the century. So I think this indicates that these people are not really looking at some of the basic causes, some of the basic problems, but they are looking at these things in a crash program point of view and this I am afraid is not safe. Governor Reagan, I am convinced - and I would say this about Governor Brown if he were still Governor - just simply doesn't understand the problems of environment and population. A little over a year ago in a conference where I spoke, the Governor said among other things that since World War II something like 40% of our skilled worker force has been brought in from other parts of the nation and in fact from other parts of the world. Now it is estimated that during the decade of the 70's we shall be required to import another 2.4 million skilled men and women to meet the job demands in our growing businesses and industry and to keep pace with our expanding economy. The Governor, I think, has not really bothered to look into some of these things at all. It is simply business as usual with a few crash programs thrown in.

...there are going to be 50 million people in California by the turn of the century.

It is simply business as usual with a few crash programs thrown in.

And when we look more closely, say at the San Francisco Bay area, we find that there are goups of people putting advertisements in the newspapers and on the radios, saying "Come to Santa Clara County. The population is going to grow, it's going to double in ten years from 1 to 2 million people." "There is plenty of space, plenty of everything" and so forth. We've got people promoting another airport at the southern end of San Francisco Bay. We have the city of San Francisco beginning to truck its garbage and filling in low lying areas along the Bay instead of doing something about permanent solutions to the problem. They've known for years that eventually they would have to do something about a permanent solution, namely recycling, but yet the city fathers sit there and do nothing. We even have Stanford University

We have the city of San Francisco beginning to truck its garbage and filling in low lying areas of San Francisco Bay.

leasing some of its land for a 15 million dollar office and convention center at an intersection which is already at peak traffic and difficult to get through. We have a combine consisting of the Lance Company and the Chase Manhattan National Bank under David Rockefeller trying, if they can, to level the one decent open space of any size in Northern San Mateo County and truck the top of the mountain to fill the Bay for more "smog-free industrial sites." So we really have, I think, a great deal of education still to do. We may have to give up on the oldsters; maybe our only hope is dealing with youngsters. The point I am trying to make is this - that we haven't really, despite all of the talk, convinced the public at large about the problems we are facing. Something else that depresses me is that I heard a State Senator say the other day that, "Yes, they certainly have got the message in Sacramento and they are all introducing bills at a great rate." But yet, when you talk to that Senator he is not willing to do anything except prepare for people who want to move to California. He is not trying to change attitudes in terms of the "carrying capacity" of a particular area; all he is saying as all Federal courts have said is that you cannot keep people out of an area; all that can be done is try to accept them. He's not interested in attitude change at all. So I've introduced then the general attitude: business as usual, clean up little things here and there and do not really get to the crux of the problem.

We may have to give up on the oldsters; maybe our only hope is dealing with youngsters.

He's not interested in attitude change at all.

And then, too, if you look through the advertisements in Fortune magazine, for instance, or Time magazine, all the companies, all the great polluters, are instantaneously trying to indicate how responsible they are. They're using the word environment in their advertisements as thought this somehow is going to demonstrate they are really doing a good job. Of course you really can't blame them I suppose. For a long time people in many areas of life; industry, government, medicine, and what have you, have been doing things which they consider to be

...all the great polluters are instantaneously trying to indicate how responsible they are.

great. For example, making automobiles for everybody - Herbert Hoover said "A chicken in every pot an automobile in every garage." That was certainly the national goal at one time. And all of a sudden now come the biologists and others saying that many of these beliefs are bad and naturally you can expect some sort of reaction. These people honestly are not bad they just have to look at things in quite different ways. If you are instantaneously confronted with changing your ideas it obviously is very upsetting.

"A chicken in every pot an automobile in every garage."

These people honestly are not bad...

What I would like to do now, after indicating that I think we still have a long way to go, is to suggest some of the kinds of things that I think we must try to impart to our students whether at the elementary school, high school, college or graduate levels. What we are talking about now, that is environmental and population problems, these ideas have to be introduced just as early as possible. We must continue this kind of education, not just mention it once and then forget it. This should some way permeate the curriculum as much as possible and I am certainly not suggesting that we throw away all of the other concepts that are important. Much of what I am really arguing for is a change of attitudes, because I think attitude change is essential if we are going to solve some of these problems.

...these ideas have to be introduced just as early as possible. We must continue this kind of education, not just mention it once and then forget it.

Now I am personally not an expert in curriculum although I can give you Thomas's rules of curriculum revision and I think they are applicable. First of all, you can't possibly teach anyone everything we would want him to learn. Life is too short for that especially considering the small amount of time we have children in school. Second, no matter what we decide to teach, a particular group of people is going to criticize and say you are teaching the wrong concepts. And the third rule of curriculum revision, so far as I am concerned, is that one can't get too concerned about creating the perfect curriculum because there is no such thing. My general idea of a good curriculum is one in which there is constant change

First of all, you can't possibly teach anyone everything...

...one can't get too concerned about creating the perfect curriculum because there is no such thing.

and in which there is experimentation--if you try something and it does not work you try it a different way.

I think many of these ideas I shall mention are so very important that they must be gotten across in class in some form. Even though we may at times get parental backlash we cannot really leave some of these things to parental blundering. I think we simply have to step, even if we don't want to, on parents' toes when they start complaining. In other words let's not have society suffer because a few parents don't want certain ideas presented.

...we cannot really leave some of these things to parental blundering.

Well, the first concept that I think you must get across to youngsters is the idea that this little world we live on is a finite one. Over and over again I get comments from people, from youngsters and adults. As they come across the country they see all that empty space and assume just because it is there and it is empty it can be used. They do not have the concept of "finiteness of space." We have, after all, something on the order of 200 million square miles of land surface on the earth and that's it! That's all we have! The world is a closed system. Yes we can get energy from the sun but energy is re-radiated! A lot of the energy from the sun came to us in the past! It is of course what we are using up now at a very great rate. I think the concept that the world is not only for mankind is another concept we must get across. There are something of the order of 5 million other kinds of living things in the world. Biology curricula have not in the past emphasized this very much. And all too often when we portray these ideas, we do it in a sort of a cute, Disneyland movie which somehow puts it in an unreal light. The role of man as the dominant species is something we should begin to get across. We are not creatures which are exempt from nature: we are a part of nature - in the final analysis nature is always at bat last. When we consider the five million kinds of living things we also have to get across the idea that every organism that has ever lived used a proportionate part

We are not creatures which are exempt from nature: we are a part of nature - in the final analysis nature is always at bat last.

of its surroundings; there is no question about that. We use our surroundings: this is simply a part of the system that we cannot avoid. The rub comes of course when we over-use the system, when we over-use our surroundings, or when there are too many of any one kind of organism. And I think we have to present the earth as a system and that it is composed of a series of systems in which there are relationships <u>in</u> systems and there are relationships <u>between</u> systems. The state of California is a system. Coastal sand dunes are systems; a Redwood forest is a system; a Douglas Fir forest is a system; a school is a system; a family is a system; and you and I individually are systems. Within any system there have to be relationships, there have to be forces acting which tend to keep that particular system functioning. A good system is one which will function for a long period of time. There is no such thing as a system which will last forever! None of us will last forever and we know that at some time the world will cease when the sun runs out of its hydrogen. But over long periods of time a system tends to remain stable and much of the activity which goes on within it maintains it as a stable system. A beautiful example of this is the United States Congress. This system is a very stable one and a great deal of effort is expended to keep it in exactly that same way. A system then needs stability in order to continue to function. On the other hand a system which is so very rigid is apt to eventually come crumbling down around itself. So we are faced then with the need for stability on one hand and flexibility on the other. A good system then is one which is sufficiently flexible, sufficiently rigid, sufficiently stable and has practibility within it so that it can change with time. The rub, of course, comes in trying to maintain that balance. To talk about extremes, that's easy! Where the two meet, that is of course the complicated part. But I think that most people probably don't conceive of systems in this way. I can understand some of our most militant younger colleagues and their

On the other hand a system which is so very rigid is apt to eventually come crumbling down around itself.

frustrations when they see that many systems are so very rigid. They think the only way to change things is to tear them down. Well, perhaps in the past this was the way to do things but I am pretty much convinced now that we don't have time to tear down our systems whether they are political systems, social systems, or educational institutions and rebuild them. In the struggle to create stability out of instability a lot of the problems we are concerned about probably will not be dealt with initially. Those, I think, are rather basic considerations of the world in which we live. In some way they must be gotten across to people and of course we are talking about school children, specifically.

They think the only way to change things is to tear them down.

One other important area we've somehow got to get across in better fashion than we have is the meaning of ecology. The word "ecology," in the strict academic sense, means that field of study or that science which deals with relationships of living organisms to their surroundings. Ecology then has actually become synonomous with the word "environment." I use the word "surroundings," as you see, in preference to the word "environment" because as I have already hinted people who use the word "environment" think that they can fool you when they talk about good environment. Really what they are talking about is a man-made, man-oriented, man-centered environment.

To be an ecologist is a very, very difficult task...

To be an ecologist is a very, very difficult task because of the number of diverse areas involved. In the strict sense there are very few ecologists in existence. We have, for instance, only one person on the staff of the faculty in biology who I would consider an ecologist. Yes, we all know something about ecology but our primary thrust is not in that direction.

Briefly, let me indicate what I think are the principles of ecology because I think these are important ideas to get across to students. If we were to go through almost any high school in this country and ask every third student what ecology is one would get the

most horrible, garbled, invalid answers you could imagine. I put the principles in the following way: first of all, we cannot create anything and we cannot destroy anything. All we can do is change things. So when we did as we did in Central California recently, that is ban most burning, we must now haul debris out to the dump creating another problem. In the days when we burned things we weren't really getting rid of anything we were simply changing it to carbon dioxide, water, ash and so forth. So we cannot create anything and we cannot destroy anything. There is nothing that we can flush down the sewer as it were. The oceans, lakes, streams and rivers are not infinite sumps into which we can put things whether pesticides, fertilizers or heat.

So we cannot create anything and we cannot destroy anything.

Secondly, there is no such thing as a static system. There is constant change within any system, within any part of the surroundings.

Secondly, there is no such thing as a static system.

The third principle is that when we change something in one part of our surroundings it will effect the environment in some way; the greater the disturbance to a particular part of our surroundings the more widespread those effects are apt to be. If we for instance cut down one tree on a slope there will be some local rearrangements of plants and animals for a while, but this will not spread much beyond the confines of where that tree was cut. If on the other hand we cut down a whole forest on a hillside, all the trees, we are going to not only possibly prevent that forest from regenerating, we are undoubtedly going to have increased erosion and runoff, as well as changing the weather pattern slightly especially in regard to winds. The effects of this are going to be felt at quite some distance. When we think of some of the mass engineering schemes that have been proposed and are being built, such as the Aswan Dam, the effects of those projects are going to be very, very much more widespread. We think of such projects as a sea water level canal across the Isthmus of Panama which has been contemplated in some circles. The effects of that will extend much beyond just the trench that is dug. The mixing of the

The third principle is that when we change something in one part of our surroundings it will effect the environment in some way; the greater the disturbance to a particular part of our surroundings the more widespread those effects are apt to be.

vegetation and the fauna of the Pacific and the Carribbean will produce results that people can scarcely anticipate.

The fourth rule is that every system has a buffering capacity or a carrying capacity but this carrying capacity like the world itself is not infinite.

The fourth rule is that every system has a buffering capacity or a carrying capacity but this carrying capacity like the world itself is not infinite. We tend to think that we can dump things into the ocean as though the ocean is infinite but indeed it isn't. The air is finite also. Looking at pollution from this point of view we see that we are simply exceeding the carrying capacity of some parts of our surroundings. The carrying capacity also applies of course to the population size of any organism that you want to talk about. In any particular situation there is a carrying capacity or a buffering capacity for population size.

The principles of ecology are really basically pretty simple.

The principles of ecology are basically pretty simple. Being an ecologist as I have said is very difficult. Along these lines we also ought to get across to people, in a realistic way, what food chains are all about. The intricacy of food chains, food webs, food pyramids, and something about how energy flows through an ecosystem, which probably is not appropriate for first graders but may be appropriate for tenth graders. The concept of carrying capacity with specific examples could be put in any number of ways. How many acres does it take to support one cow in different situations? These very practical examples could get across all of these ideas. Predator-prey relationships and cycles of predator-prey relationships are important to get across as well as the complexity of nature and interdependence of things within systems. The concept of the ecosystem - we really have to consider the whole world as a commons and when we increase our use of the commons a bit over the next guy we may be richer for the time being but in the long run everybody is poorer on the average. So the whole concept of ecology--what ecology is, and what ecology isn't--I think must somehow be got into the curriculum and particularly on the principles level.

Another very important point that must be expressed over and over again is the relationship between human population and environment deterioration.

Another very important point that must be expressed over and over again is the relationship between human population and environment deterioration. This is one of the points that is not currently stressed at all adequately so far as I am concerned. I usually put in the form

I usually put in the form of an equation the relationship between population and environmental deterioration.

of an equation the relationship between population and environmental deterioration. The population we have in the world today is 3.6 billion and increasing. In the world today the average growth rate is 1.9% per year. We add 68.4 million people to our planet every year plus very high living standards in parts of the world. The United States for instance with 6% of the world's population uses something between 1/3 and 1/2 of the annual production of raw materials of the world, per year, plus rising expectation for higher living standards throughout the world. In summary then these are the four factors which contribute to environmental deterioration; the population we now have, the increase in population, the high living standards in parts of the world, plus the rising expectations for higher living standards elsewhere in the world. That's true of Portland, Oregon too! Now when one looks at that equation - whenever we talk about any of the aspects of environmental detericration whether it is air pollution, problems of the inner city, problems of noise pollution, heat pollution or pesticides - the one component we can never reduce to zero is population. We can simply not be more matter of fact when we talk about these things. It's fine to clean up air pollution, but yet if we don't consider the population aspect of this, all we do is fight a losing battle.

Now, most of us do not want to admit that people cause pollution. I have argued very vigorously on this subject. But you will find that the great majority, like about 99.9%, of those who are concerned about population and environmental deterioration would agree in essence with the equation that I just gave you, that is the relationship between population and environmental deterioration. What we are really doing when we increase population is to make every single system that we deal with more complex. Hence, the problem is greater in terms of solutions and it may indeed get to the point where the size of the population is such that it precludes solutions to some problems in other than very drastic means.

In addition I think we should try to get across to students something about population distribution, actual facts and figures about population numbers.

In addition, I think we should try to get across to students something about population distribution, actual facts and figures about population numbers. I know for some people to say that 3.6 billion people inhabit the world probably doesn't conjure up any sort of threat, but there are ways of getting these ideas across. I am currently involved with two local high school teachers near where I live in trying to design a game. It's quite an interesting game attempting to show the relationship between population and environmental deterioration. It is a three stage game; the first couple of stages follow certain suggested rules. In the last stage you make up your own rules in any way you wish but winning is impossible. All you can do in the area of population stabilization is to simply buy a few more years of time. Perhaps this is a way of introducing some of these important concepts at different levels. When we talk of population we have to get across the notion that at some point population must stop growing. I don't think we want to scare youngsters by saying they face starvation, war, famine or disease. But in some way we've got to persuade them that there have to be limits to population growth. Some of these concepts may not be what we are usually taught because they are counter to humanitarian ideas and ideals.

...but winning is impossible...

I don't think we want to scare youngsters by saying they face starvation, war, famine or disease.

We tend to put man first in the world and everything else takes second place. We don't really appreciate our reliance on the rest of the living world. We could not exist if we did not have Escherichia coli in our intestines just as an example. Perhaps juniors and seniors in high school could begin to appreciate the philosophical outlook that has put us into the mess we are in today. Obviously a realistic discussion of environmental deterioration, its dangers and possible solutions should be stressed. Again, I don't think we should scare students out of their wits but yet I think that these ideas can be inserted in the proper way and at the proper time. I think one of the most essential things - and exactly how you implement this I am

I think one of the most essential things- and exactly how you

not sure except to keep plugging away at it - is to insist that by the time a youngster gets to the age of puberty he knows the facts of life realistically and that he knows how to prevent conception. It's a bit discouraging as I travel around to find that the illegitimacy rate in that particular school is five per cent for girls age 13, 14 and 15. It's no use closing the barn door after the horse is out. I think this is so very important that even if parents complain society has the right to take responsibility from them if indeed parents do not wish to do anything about this. It's been my experience that the parents who do the best job of teaching their children about sex education are the ones who welcome the reinforcement that comes from a good course in school. The parents who know the least and do the worst job are those who complain the loudest. I've looked at some of the educational television programs and films concerning this matter and I see absolutely nothing objectionable in them even for very small children.

implement this I am not sure except to keep plugging away at it-is to insist that by the time the youngster gets to the age of puberty he knows the facts of life realistically and that he knows how to prevent conception. I think this is so very important that even if parents complain society has the right to take responsibility from them if indeed parents do not wish to do anything about this.

We tend when we look for the solution to a problem to hope that there is going to be a simple one only to find that from a systems point of view there are no simple solutions.

We tend when we look for the solution to a problem to hope that there is going to be a simple one only to find that from a systems point of view there are no simple solutions.

I think we've got to very critically re-evaluate and express in different ways what science is all about. I was taught both at Cal Tech and Stanford that as a "scientist" I was supposed to do whatever the experiments led me to, whatever my reasoning led me to, and not worry about anything beyond that. This somehow was somebody else's responsibility. Well, I've completely disavowed that concept of science. I think no one should be engaged in scientific activity unless he is very thoroughly aware of the social consequences of his activity and possibly even the social costs. Just because something is possible, this is not necessarily reason to do it. This to some people will sound like a very unscientific or anti-science attitude. I don't think it is. I simply feel that we can no longer afford to have scientists live in ivory towers absolving themselves of what they create.

I think no one should be engaged in scientific activity unless he is very thoroughly aware of the social consequences of his activity and possibly even the social costs.

Furthermore, when it comes to government support of science we've got to start looking at it in terms of priorities. Also the concept that science and tehnology will solve all our problems if we just wait long enough is a pretty self-defeating proposition.

What I really think we must do is to change the thrust: we must change some of our most cherished and fundamental beliefs.

What I really think we must do is to change the thrust: we must change some of our most cherished and fundamental beliefs. We have, for instance, grown up to think that growth is good. Now we are faced with the problem of accepting that growth per se is not necessarily good. This is not an easy thing to do. We tend to glorify the biggest, the best, the tallest, the fastest and the richest. I'm saying yes, up to a point, growth is good but beyond that point it's bad. We must expose not only one side but both sides of this issue. We have also tended to think that quantity is good and have ignored the matter of quality. We've taken great pride for instance in the fact that in this country today we have hundreds of millions of automobiles. We express pride in this but we rarely talk about the quality of what we produce. This is not an easy concept to get across but I think it can and must be done.

Another very important change which parents will confront is the whole question of family size.

Another very important change which parents will confront is the whole question of family size. We have assumed to date that it is the right of the parents in this country to have as many children as they can afford. We must now ask the question in a different way. How many people in the world are there to support and what is our share of that? My personal opinion is that two children per family for the next five decades is probably one too many because thirty-one per cent of our children are under fifteen: they have not reached their reproductive age. The population of the United States, assuming two children per couple right now, would not stabilize for about fifty years. These are very difficult things to get across and yet I don't think we should let parental teachings in these matters stand in our way. It's much too important to let

blundering parents keep us from getting the message across.

I think one of the most critical problems - this is why in many ways I believe education has failed us in this country - is that we have not provided most people the tools, the faculty, or the understanding of how to take a set of facts and come up with an objective evaluation of those facts. We still as a nation tend to act on emotion rather than reason. Despite all the training we have, it is very difficult to get people to look at facts objectively, unencumbered with emotion. Yes, there are whole areas of our lives where we can permit emotions to guide us. However, there are other areas in which we cannot afford this luxury.

I think one of the most critical problems-this is why in many ways I believe education has failed us in this country-is that we have not provided most people the tools, the faculty, or the understanding of how to take a set of facts and come up with an objective evaluation of those facts.

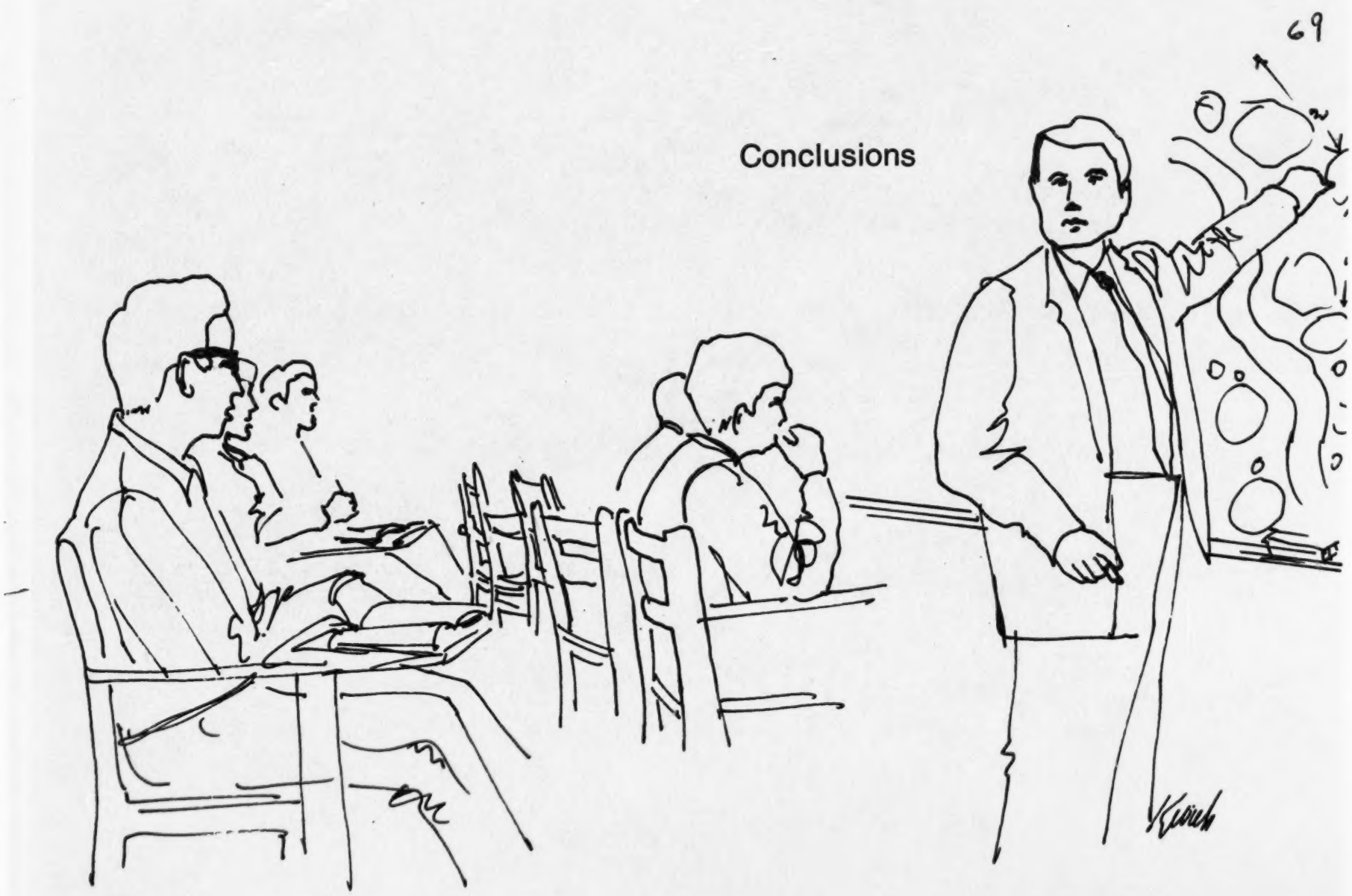
Despite all the training we have, it is very difficult to get people to look at facts objectively, unencumbered with emotion.

One of the things that I have come to feel important is that in our haste to teach people about these problems we do not prescribe another course of study, for example Environmental Studies which comes fifth period. This will turn into just another curriculum addition: some will like it and some won't. This defeats the whole system. I feel that these concepts should be introduced not as a specific course but rather in context with other studies. The ways and means of doing this I cannot really advise you on.

One of the things I have come to feel important is that in our haste to teach people about these problems we do not prescribe another course of study...

Let me close by recalling something from a book I have been rereading lately. It was one of the books that was around our house when I was growing up in Europe, Van Loon's Geography published in 1932. I still remember a picture of a box a mile on each side filled with all of the people of the world - which then numbered roughly two billion - all crammed in the box. It was teetering there on the brink of the Grand Canyon. Van Loon was attempting to portray the immensity of the Grand Canyon. That whole box a mile on a side could be pitched over into the Canyon with all the people of the world and you could look straight across and you couldn't see the box. This was a psychological imprint of the population problems during that period of time. I would like to conclude my talk with this, we are all fellow passengers on the same planet and we are all equally responsible for the happiness and well-being of the world in which we live. Thank you.

Conclusions



Green is for Trees

"Conservation" means "savings." Currently we're talking about saving our men in Vietnam, saving money for vacations, saving time for recreation. We are also talking about saving our nation's natural resources to enable us to extend our lives beyond the concrete landscape of the city blocks.

We want green in our lives and in our children's lives, not the green of money, the green of grass, of healthy, growing shrubs, of trees nourished by clear water.

We want to save some portions of America's first bloom; to renew our drooping spirits after the hard days of earning our living. We need to be able to refresh ourselves close to our roots. We need to be able to bring more of these roots into our cities so that we will not feel cut off from their nourishment.

So far, there is not much evidence that we, as a people are "saving" much of our heritage, except in talk. We need to *do,* not *talk,* as the saws buzz busily in the groves.

Prudence Nelson

CONCLUSIONS

I. A K-12 Program. Outdoor education has usually been part of the great tradition of successful teaching since early times. That it is primarily education about the out-of-doors, about nature, about conservation of natural resources is too narrow an interpretation. It is not a study limited to the 5th or 6th grades or to natural science, social studies or conservation. It is education in the out-of-doors or in an environment which permits all students to examine the natural or man-made world on a first-hand basis. It begins in kindergarten or from the first contacts the school has with children and permeates the total curriculum throughout formal education. Wherever possible, it affects all citizens in the community.

II. An Interdisciplinary Approach. To impress students with man's dependence upon nature, his relationship to it, and his consequent responsibility for the welfare of nature, insofar as he is able to affect that welfare, students find the environment the most natural setting for the necessary learnings. Here the first-hand, on-the-spot study of life and its interrelationships with its environment is possible. Here inspiration for the fine arts, the creative arts, and those areas of the curriculum which can be observed best in their natural setting are possible. Learning becomes interdisciplinary where the major concepts and desired outcomes associated with various subjects melt together into a meaningful pattern.

III. Process Orientation. From the forest biomes of the Appalachian Mountains, the Rocky Mountains, or the Pacific shores to the asphalt streets of metropolitan centers, teachers and students have a most diversified and accessible selection of outdoor classrooms and field laboratories. How can we get more students to see, feel, smell, prove, discover, identify, and think for themselves about some of our society's most pressing problems? How can we get them to begin to understand the intricate interrelationships operating in their environment? When can students start to behave intelligently and consistently towards the environment?

The data collected from the real environment provides the most accurate raw materials with which students can develop the cognitive skills and processes for solving meaningful problems and for making intelligent decisions. The sensitive teacher will continually strive to have students exhibit these skills. The instructional climate will have the student do much more

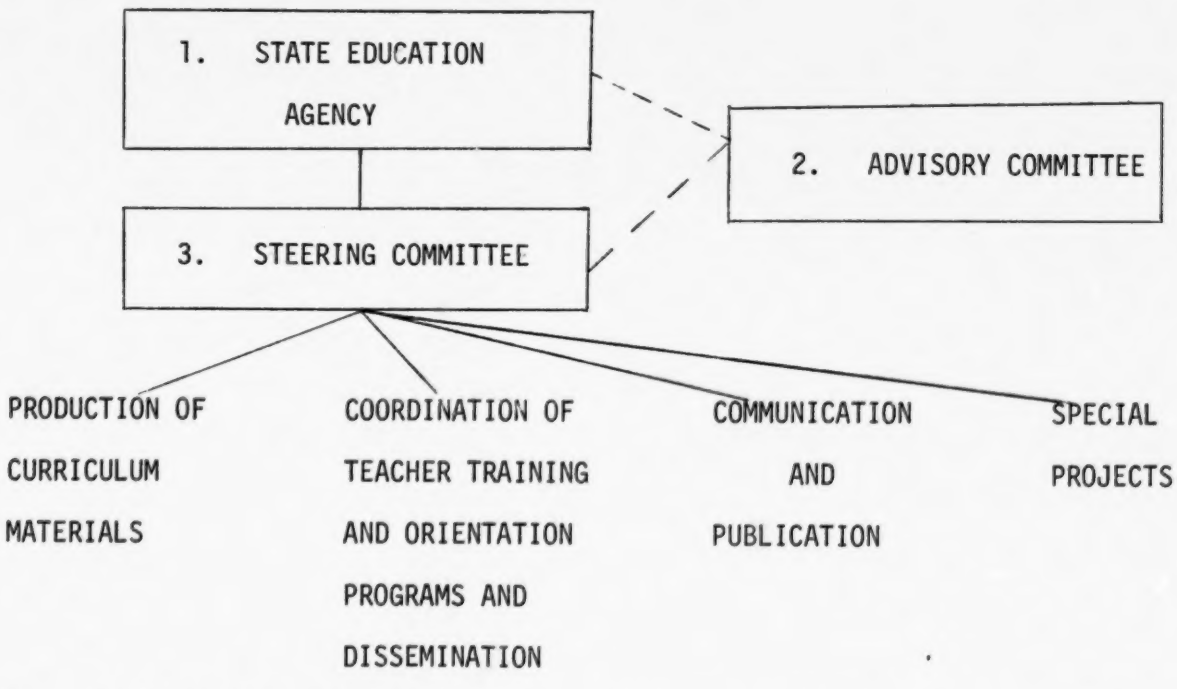
than engage in acceptable rhetoric. He will observe, collect data and information, interpret, experiment, formulate conclusions, and express his interpretations. He will recognize alternative interpretations, and he will learn to challenge ideas which are not based on evidence. At higher levels he will demonstrate greater competence to logically and critically study many aspects of his environment. At the same time, he will be led to perceive himself as a rational individual who is capable of relying on his own physical and intellectual resources to a considerable extent. Concurrently, he must interact with his peers and with adults, and have countless opportunities to develop more effective ways to interrelate with others.

IV. Attitudes and Values. An environmental education program projects attitudes and values. These affective goals elicit behaviors which tend to continually improve or maintain a liveable environment. The degree to which individuals appreciate, respect, are considerate of, or are humane can often be inferred from their behaviors. Teachers need to be continually aware of situations where students can discuss and express points of view which reflect value judgments. Students need opportunities to share their ideas with each other using democratic processes.

SUGGESTED RESPONSIBILITIES FOR STATE EDUCATION AGENCIES

AN ORGANIZATIONAL MODEL

State education agencies play a major role in encouraging, developing, and implementing environmental education programs. One model for organizing operations at the state level is offered here for reference purposes. It is understood that this model may be altered in structure and function from state to state.


1. STATE EDUCATION AGENCY
2. ADVISORY COMMITTEE
3. STEERING COMMITTEE
PRODUCTION OF CURRICULUM MATERIALS
COORDINATION OF TEACHER TRAINING AND ORIENTATION PROGRAMS AND DISSEMINATION
COMMUNICATION AND PUBLICATION
SPECIAL PROJECTS

1. The State Education Agency. The state education agency has primary responsibility for educational leadership within the state. It, therefore, must assume control and direction of publications and programs originating at the state level. It is imperative that the the state does not attempt to write a program in house, but would set up monitoring machinery and subcontract the actual writing and production of unitary materials and programs.

2. The Advisory Committee. In every state there are groups that can contribute ideas, financial resources, and political expertise to the state program. An advisory committee composed of representatives from industry, state and national resource agencies, and community interest groups can identify needs, review materials, and provide valuable advice with respect to procedures, direction, implementation, and funding. Such a group might also apprise members of the legislature of the progress and needs in environ-

mental education programs. An advisory committee would be essential in developing projects such as a state or regional environmental/ecological education center which can be used for research and resident outdoor school programs for thousands of students throughout each year.

3. The Steering Committee. The interdisciplinary nature of environmental programs requires the input from many individuals. The steering committee would be composed primarily of a subset of state education agency personnel. These would include the specialists in social studies, language arts, science, guidance and counseling, art, music, physical education, etc. Each member would be expected to contribute suggestions and talents to develop a comprehensive program. The steering committee would arrange for and coordinate groups working on special tasks and projects.

The Principal Functions of Steering Committee Activities:

a. The Production of Curriculum Materials

1) Assess and analyze the status of environmental education programs currently operating within the state (programs, facilities, resources).
2) Establish guidelines for environmental education programs.
3) Identify concepts which are interdisciplinary and which form the major objectives towards which the program should aim.
4) Develop model instructional objectives and assessment techniques.
5) Develop strategies for instruction.
6) Develop a diversified inventory of materials.
7) Organize writing teams to develop curriculum guides and materials for grades K through 12 or 14.
8) Edit and approve all materials produced and coordinate writing efforts.
9) Support the involvement of local personnel to develop local programs which take into account local problems and situations.
10) Organize a feedback system which facilitates continual improvement of the program.

b. The Coordination of Teacher Training and Orientation Programs and Dissemination

1) Develop a strategy for program implementation.

2) Coordinate efforts with colleges and universities to implement environmental education programs into pre-service teacher training program.

3) Provide leadership to conduct in-service workshops in school districts that use environmental education publications and materials.

4) Articulate with local committees to identify regional and local needs and objectives.

5) Prepare and distribute teaching aids, bibliographies, and other supplementary materials.

6) Develop strategies of instruction for in-service and pre-service programs which are consistent with the student materials.

c. Communication and Publication. This operation would involve editing, publication, publicity, and distribution of materials developed by the production groups. Newspapers, television, newsletters, and other media would be used to inform administrators and teachers of the availability of the materials.

d. Special Projects. It is most desirable that special projects, such as a television series, be developed to correlate with environmental education programs. The television media can bring to the student those aspects of the environment which are not accessible to him. It is clearly recognized that a television series using similar techniques as those incorporated in "Sesame Street" would have a tremendous impact in development of both conceptual and attitudinal objectives. Hopefully, such a television series can be produced by a state or federal agency and attract a national audience.

PROPOSED OBJECTIVES FOR AN ENVIRONMENTAL EDUCATION PROGRAM

The conference identified a number of objectives for an environmental education program. They are grouped into program objectives and objectives for students. When developing a program, schools are urged to state program objectives in terms of student expectations and incorporate these into the evaluation or assessment aspect of the program. Some examples of objectives are listed.

I. Environmental education programs should:

1. Develop in students an awareness of problems associated with population, natural and human resources, and related environmental problems.
2. Develop in students an awareness of need for individual responsibility to maintain or improve the problem situations.
3. Identify the environmental problems which exist in the community.
4. Incorporate environmental resource materials into selected areas of the school curriculum at all levels of instruction.
5. Develop a student population which exhibits cognitive learnings and affective behaviors which support productive interaction between students and the immediate environment.
6. Provide field trips into the community to study the environment as it exists.
7. Provide laboratory facilities and study plots to conduct controlled studies.
8. Provide orientation sessions for parents and community groups.
9. Provide continual experiences starting in kindergarten or first grade and extending through all grade levels. These should expand the students' understandings of ecological relationships as well as improve their competence to investigate the environment and to make assessments at the level of their maturity.
10. Increase the awareness, appreciation, and understanding of the principle of interdependence of living organisms and their environment.
11. Help students grow in ability to accept responsibility to maintain or improve their environment for future use.
12. Develop an appreciation for the value of natural resources to improve life and to maintain the economy.

13. Provide in-service training for staff.

II. <u>As outcomes of an effective program, students should be able to</u>:

1. Exhibit behaviors which demonstrate a desire to maintain or improve a quality environment.
2. Describe the conditions in an environment which maintains an ecological balance and identify which condition or conditions alter the balance.
3. Demonstrate his desire and ability to improve identifiable conditions in his environment.
4. State the pros and cons of conservation issues (Use of DDT vs. crop production, draining swamps vs. duck hunting, wilderness areas vs. parks, preservation vs. use, industrial growth vs. pollution, convenience vs. pollution, etc.).
5. Actively participate in discussions related to environmental problems including man's management roll in enhancing or alleviating these problems.
6. Demonstrate the use of logical methods of inquiry in determining the status of environmental pollution and degradation.
7. Identify conditions in the environment which are deteriorating and describe effects on life in the community.
8. Describe or demonstrate actions which prevent degradation and those which tend to restore environmental quality.
9. Demonstrate a personal commitment to intelligent management by exhibiting behavior, such as voting on the basis of known data and avoidance of littering and defacing property.
10. Demonstrate an ability to contribute feasible solutions to environmental problems which are identified.

THE SPECIALIST IN ENVIRONMENTAL EDUCATION

There was consensus that a specialist in environmental education should be designated by each state education agency. The primary responsibility of the specialist would be to promote an environmental education program at the state level. More specifically, he would:

1. Establish a clearinghouse for materials, activities, and resources associated with environmental and ecological education.
2. Develop evaluative instruments to assist program directors to assess the effectiveness of existing programs and to make recommendations for improvement.
3. Provide leadership for inter-agency cooperation.
4. Promote, coordinate, and/or conduct pre-service and in-service training programs.
5. Consult with architects and school planners on school site development and recommend the preservation or development of natural land areas for study purposes.
6. Consult with local schools on initiating and developing environmental programs.
7. Provide leadership for the operation of state committees.
8. Establish lines of communication within the state between all interested groups.
9. Promote work-study projects which might be developed with industry, conservation agencies, or interested community groups.

DEVELOPING MATERIALS FOR ENVIRONMENTAL EDUCATION

As reflected in previous sections, a wide variety of curriculum materials and resources are needed at all levels of instruction. Every conceivable media for instruction should be used to their best advantage to instruct, supplement, reinforce, and motivate students in achieving objectives.

I. Media. Media may include:

References	Speakers	Dramatics
Textbooks	Film Slides	Special Publications
Films	Pictures	Laboratory Experiences
Audio Tapes	Charts	
Transparencies	Models	
Periodicals	Television	
Film Strips	Radio	

II. Materials. Samples of materials are:

1. Lists of interdisciplinary concepts which may be used by curriculum groups.
2. A series of suggested activities and investigations on a variety of topics at different grade levels.
3. Bibliographies and resources.
4. Reports of exemplary programs.
5. Critiques of materials.
6. Equipment lists and their sources.
7. Television programs which incorporate some of the strengths of programs such as "Sesame Street."
8. Radio programs.
9. Suggested activities, such as dramatic productions, writing essays, designing posters, etc.

III. Characteristics of Materials and Activities. Perhaps the most important aspect of material production is the ease and effectiveness with which they can be implemented and the outcomes achieved by students. Those developing materials are encouraged to incorporate the following characteristics in designing them.

1. Units or activities should be non-sequential or loosely sequential to facilitate flexibility in use and placement.
2. The selection of topics should be varied to the extent that some may be appealing to and used by almost all teachers, regardless of assignment. They should enrich, extend, or amplify present offerings.
3. The materials should be written for a general grade span rather than for a specific grade.
4. Units should include the study of natural and man-made systems.
5. Units designed for the lower grades should emphasize the use of basic processes for solving simple problems. These processes should include observing, using numbers, inferring, using spatial relationships, etc. Mature students should develop competence in more sophisticated processes and procedures dealing with complex problems in the community and nation.
6. The program materials should promote activity with authentic elements of the environment permitting conceptual understandings to take place according to individual abilities and maturity.
7. Materials should enhance the decision-making ability of students.
8. The curriculum materials derived from some of the newer programs, such as Man, A Course of Study and the Science Curriculum Improvement Study should be examined and used as models for developing new materials.
9. Materials should be designed to stimulate interest.
10. Materials should meet the needs of students from differing socio-economic levels and geographic areas.
11. Materials should be designed to develop basic concepts in ecology.
12. Materials should incorporate promising teaching strategies.

13. Materials should incorporate evaluation techniques or instruments which access the attainment of stated objectives.
14. Activities should be designed for both individual and group participation.
15. Activities should encourage the use of all of the senses (hearing, seeing, smelling, tasting, and touching) where appropriate.
16. Activities should take place in the real environment wherever possible.
17. Activities should be selected to expose students frequently to the same environmental problems and ecological concepts from different frames of reference.
18. Activities should encourage the development of hobbies which may serve life-time needs.

Appendix A

The Last Remnants of Eden
(an excerpt)

While acts Man the mutilator,
While terming himself a great creator?
I do not know, but fact is fact,
And, by his hand, albeit unplanned,
Eden is changing to garbage land,
Faster than I care to see.
Why can we not let free stay free?
And beauty beauteous in Nature's way?
Why must we play tormentor?

James Harter

GROUP I

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A. Philosophy

B. Objectives for State Education Agencies

C. Sample Student Objectives

D. Sample Program Objectives

E. Organization and Composition of State-wide Committees

F. Strategies for Implementing Environmental Programs on a State-wide Basis

A. Philosophy

Group I.

Time is our master and our slave. Those who inherit our legacy will be our evaluators. Environmental awareness must not become a short-lived fad. Near-sighted, myopic vision toward solutions and behavior modification must be avoided.

The President's Council on Recreation and Natural Beauty has stated, "Much of the nation's environmental deterioration can be attributed to the fact that most Americans are ill-equipped by their education to understand and influence the forces acting on the immediate world around them."

Lamont C. Cole, Ecologist, Cornell University warns, "...man, in the process of seeking a 'better way of life,' is destroying the natural environment that is essential to any kind of human life at all; that, during his time on earth, man has made giant strides in the direction of ruining the arable land upon which his food supply depends, fouling the air he must breathe and the water he must drink, upsetting the delicate chemical and climatic balances upon which his very existence depends."

As the thinking child endlessly explores who he is, where he came from, and where he is going, he must meaningfully consider and personally resolve the age-long questions: What relationship have I to other human beings? What relationship have I to a Supreme Being? What relationship have I to myself? and What relationship have I to other living forms?

The Engineering concept that complex problems have complex solutions and the scientist's view that the complexities of nature can and will be resolved into manageable relationships when viewed from the proper point of reference, add support to the need for a multi-disciplinary approach to Environmental education.

Science education should contribute it's heuristics, content field data base, and pedagogy. It recognizes the intrinsic motivation of students attacking local relevant problems and recommends the use of inquiry activities such as simulations, field trips, and resident programs as possible vehicles for giving students a cognitive and affective process which supports a productive interaction between man and his environment.

These processes and concepts should permeate all levels, preschool to adult education, and diverse subject fields, but should not negate the inclusion of a special course at a specified grade level. Local problems should be used as a relevant springboard toward synthesis and evaluation of the more complex state, national and global environmental problems.

C. Sample Student Objectives

The conference recommends that our educational institutions provide a program which will develop in students cognitive and affective behavioral processes which support a productive interaction between man and his environment. His experiences should enable him to behave responsibly to his immediate environment and be aware of the consequences of his action in the gross environment.

Upon completion of their individual learning experiences, students should be able to:

1. Demonstrate a working knowledge of the delicate ecological balances that exist on our planet.

2. Make personal decisions which facilitate a reinforcing effect on the total environment. (e.g. voting, trash littering, using smaller cars.)

3. Demonstrate a personal commitment to the environment for its inheritance by future generations.

4. Exhibit divergent thinking toward creative solutions through flexible, fluent, original problem solutions.

5. Participate as a functioning member of an action team which utilizes the concept of multidisciplinary action.

D. Sample Program Objectives

The conference recommends an action program to implement the above objectives with all possible expediencies. This plan will include:

1. Careful analysis of current programs identifying inquiry activities and experiences which might serve as beginning models for environmental education (e.g., Man, a Course of Study, S.C.I.S., The Man Made World and the Portland Project)

2. Group dynamics techniques as a fundamental part of teacher in-service and pre-service experience. Specific strategies on conducting leadership development and teacher in-service should be developed.

3. Recognition that value systems and emotions are part of the learning process and should be used in a positive way.

   The program would include specific mechanism to develop a consensus of values related to the total environment.

   a. Science is no panacea.

b. There are no simple solutions to environmental problems.

c. Growth should henceforth produce quality in preference to quantity.

4. Social, scientific, economic, humanitarian, arts, engineering, communication, and environmental education.

GROUP II

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I. ENVIRONMENTAL EDUCATION

Group II

A. Philosophy and Goals

It is recognized that man lives in a closed eco-system and that many of the conditions existing in that system are a result of man's attitude toward man and nature. His advances in agriculture, industry, and science have had both positive and negative effects on the system. Since this is a finite system with a limited carrying capacity much effort must be put into stabilizing the system and thus maintaining it as a viable system as long as possible. To disregard this will result in environmental degradation and a more rapid deterioration of the system.

We believe that well-informed individuals are more likely to act objectively in maintaining the system. Education therefore will play a major role in maintenance of the eco-system. Citizens need to understand their responsibilities for the conservation of the human environment. Every individual needs to develop an understanding of the ecological relationship of man to his environment. Each individual also needs to understand the natural world and its complex balances. Our schools have a responsibility for developing in each student an awareness of the need for quality in his environment. Therefore, environmental education should be established as a planned part of the curriculum in all schools.

B. Guidelines

1. Continual Environmental Education

Development of environmental awareness is a process which is evolutionary in nature and therefore involves a continual input into the individual's conception of his surroundings. This implies that any approach taken to environmental education must begin at the earliest possible time in the learner's life and continue throughout his years of formal education.

2. An Interdisciplinary Approach

Environmental Education goes beyond the facts and processes of ecology; it is an extension of ethics and should modify attitudes to develop an environmental ethic. This environmental ethic not only involves the individual and his personal interest but his interrelationships with others and society, even the survival of society. The problem is social, scientific, economic, and therefore must be dealt with through all disciplines in the curriculum with each discipline making its own unique contributions.

3. The Contributions of Science Education

Science can make several contributions to environmental education such as developing an awareness of problem-solving techniques, developing competencies in problem-solving, and providing an awareness of availability of data pertinent to problem-solving and decision making.

4. Ecological Principles in Science Education

A unique contribution of science to understanding the environment is leading the student through a series of educational experiences to an understanding of the principles of ecology. Knowledge of ecology would equip the student to make wise quality decisions about the environment.

5. An Educationally Sound Program

The program should provide direct experiences for the pupils in a real world and continually expand these experiences to develop generalizations involving world-wide environmental phenomena.

6. Long-Range Goals and/or Immediate Activities

While the results of the program outlined through these guidelines are evolutionary in nature, calling for long-range changes in attitudes and values, the student should have experiences which provide real constructive contributions to environmental problems allowing for immediate rewards.

7. Organizational Patterns

While organizational schemes will vary among the states, certain common ingredients appear essential to effective environmental education.

a. State-level leadership.

b. Coordinator and cooperation of various organizations, agencies, and local leaders.

c. Effective information and communication systems.

d. Development of planned programs (including teacher training).

A Definite Need

There is also a need for an Environmental Education Materials Clearinghouse such as an ERIC Center on Environmental Education.

C. Classroom Objectives

1. To develop awareness, understanding, and concern of students over the challenges resulting from degradation of the natural and social environments as a result of man's management and manipulations.

2. To develop an understanding of man's relationship and responsibility for positive attitudes and action in the prevention of environmental pollution and for the conservation of the limited supply of natural resources available in man's habitat, the earth.

II. LEARNING OUTCOMES

Lea ing outcomes: As a result of environmental education, students should be able to:

A. oly scientific methods of inquiring to the problems of environmental pollution degradation.

B. onstrate awareness of the deterioration of environmental quality and its effect the quality of life in America.

C. emonstrate positive attitudes and actions to prevent degradation and for the estoration of environmental quality in the local community.

III. SCHOOL SYSTEM RESPONSIBILITIES

Schools must make the following conditions possible:

A. Provide outdoor environmental study trips for real life experiences such as: on campus, off campus to resident camp sites, guided walks to observe natural environment, polluted and degraded areas, man-made environment, and industrial.

B. Provide enabling facilities to conduct environmental studies such as adequate science classroom laboratories and outdoor environmental study sites.

C. Provide both pre-service and in-service teacher education.

D. Provide continual experiences K-12 expanding upon understandings and skills based on maturity and growth.

E. Involve students in individual and group activities and action programs for the improvement of the local environment.

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PHILOSOPHY STATEMENT

Group III

Environmental education should involve pupils in meaningful classroom and extra-classroom experiences to develop desirable attitudes toward the environment and to increase the pupil's ability to make logical decisions relative to the environment. At all levels of education (kindergarten to adult life) there is an obligation to have clearer understandings of our environment and his relation to it.

A. OBJECTIVES FOR STATE EDUCATION AGENCIES

I. Accept the responsibility for informing school districts, the public, legislatures, private groups, industry, and other agencies of the urgency of developing and implementing effective environmental education programs in all schools.

II. Promote in all local school districts multi-disciplinary environmental education programs for all age levels designed to develop an understanding and respect for the natural world and its complex balances. Such programs should include the following concepts:

a. The ecological relationship of man to his local, national, and global environments.

b. The relationship of growth to environmental quality.

c. The reproductive process and its relationship to population control.

d. The finite limitations of the earth as an environmental system.

e. The need for man to share environmental resources with all the multitudes of other organisms.

f. The role of man as the dominating life form in his affect on the environment.

g. Man's dependence upon life forms over which he has dominion.

h. The world as a series of interdependent systems in which any modification of one aspect of the system will affect all other parts of that system.

i. The nature of matter is such that it is not destroyed, only changed by interactions.

j. Mankind's growth in population, living standards and rising expectations combining to produce environmental degradation.

III. Promote the development of environmental education centers outside the classroom complex, encouraging the cooperation of school districts, higher education institutions, industry, and other agencies, where necessary.

IV. Enlist the cooperation of other state and federal agencies in helping the State Department of Education in the development and implementation of environmental education programs.

V. Cooperate with colleges and universities in developing and offering environmental education courses for students enrolled in teacher education programs and for other students as well.

VI. Provide full-time consultative help to school districts, other agencies, industry, and other interested groups in:

a. developing study and curriculum guides

b. organizing and conducting workshops

c. preparing and distributing teaching aids, lists of materials, bibliographies, and other pertinent material

VII. Develop model instructional objectives and assessment techniques.

B. ACHIEVEMENT OF OBJECTIVES

Step I - An advisory committee should be formed to plan action and advise on progress. It should be composed of several strata of the citizenry.

Step II - A survey should be conducted to ascertain the current status of environmental education throughout the state. These areas might be considered as parts of the data gathering instrument.

a. Philosophy

b. Curriculum materials in use or being developed

c. Teacher competence

d. Instructional programs

e. Identification of local needs

f. Significant science concepts which impinge on the environment

Step III - A state-wide conference should be held to educate decision makers concerning the urgency for action. Individuals who might participate are:

a. School administrative staff

b. School board members

c. State education agency personnel

d. Legislators and Governor

e. University personnel

f. Chief school officers

At this conference the following items should be considered:

a. Results of survey

b. Crisis nature of problem

c. Action recommendations of participants

d. Commitment for action at the local level

Step IV - After the state-wide conference a series of regional conferences should be organized with each region centering around a college or university. The participants from the state-wide conference will be responsible for serving on the planning committees for these conferences. The stress for these conferences will be on the local nature of problems and the preparation of change-agent teams. Such agenda items as the following might be included:

a. Nature of the problem

b. Plan of attack

1. Available curriculum materials

2. Instructional approaches

3. Determination of teacher needs

4. Local plan of implementation

5. Role of change-agent teams

6. Feedback mechanism to planning committee

Step V - Teacher training workshops/courses will be held under auspices of the regional college or university after the regional conferences and as need warrants. Planning for these workshops will be done cooperatively with the change-agent teams. These workshops/courses may be summer or in-service programs and may carry service or college credit.

C. OTHER CONSIDERATIONS

I. OBJECTIVES FOR SCHOOLS

It is recommended that the local school district identify its own environmental education problems and adapt state objectives in the solution of those problems.

The local school district should make a commitment to include environmental education materials in the total curriculum. The over-all objective for students would be to form attitudes relative to the improvement and maintenance of a quality environment.

II. ENVIRONMENTAL EDUCATION CONSULTANT

The state education department should designate personnel who will assume the responsibility for the promotion of a program of environmental education.

III. EDUCATIONAL MATERIALS

a. It is suggested that the initial effort be directed toward the identification of interdisciplinary environmental concepts.

b. The second phase of a state-wide program would direct itself toward designing of open-ended, problem-oriented activities that amplify previously identified concepts. These characteristics or attributes might apply to the finished product:

1. Student materials should be largely non-sequential or loosely sequential.

2. Developed material should not relate to a particular subject or academic discipline, but would be written for a general grade span. Thus, teachers have at their disposal a supply of activities that tend to enrich, extend, or amplify present offerings.

3. The general format of the final product should always refer to the interrelationship of natural and man-made systems (ecological, political, and sociological).

4. At the lowest level (primary grades), curricular materials should deal with single concepts, skills, and processes. Higher levels should deal with experience that can be integrated and synthesized into interacting systems.

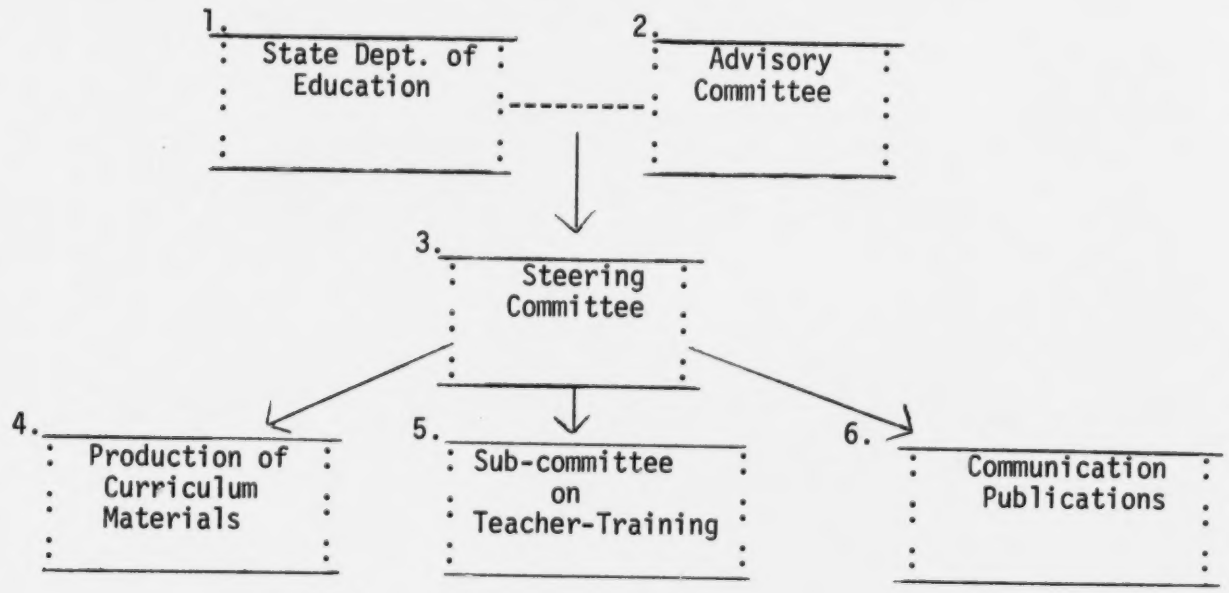
   EXAMPLE: Lower level materials might concentrate on activities such as simple neighborhood mapping. Students collect data and represent the data in some manner. They then could be lead to evaluate the collected information and to suggest ways that the neighborhood could be improved.

   A higher level activity might call for an in-depth study of the effects a dam might have on a particular geographic area: Political, ecological, etc.

   Finally at the highest level activities should be related to community action programs.

It was the feeling of our group that the primary benefit that accrues from a good environmental education program is one that enhances the decision-making ability of students.

IV. MODEL FOR THE PRODUCTION OF CLASSROOM MATERIALS



a. The state department of education has primary responsibility for educational leadership within the state. It, therefore, must assume control and direction of the final product. It is imperative that the state does not attempt to write a program in house, but would set up monitoring machinery and subcontract the actual writing of unitary materials.

b. Advisory Committee. Recognizing that there is in every state special interest groups that, while not able to produce classroom materials, bring with them ideas, financial resources, and political expertise. The primary tasks of the advisory committee would center around reviewing developed materials and providing advice regarding implementation and funding problems. Such a group might well serve to keep the legislature aware of progress and needs.

c. Steering Committee. Although the steering committee is a subset of the state department of education its members need not be limited to just state department members. However, the chairman of the Steering Committee shall be designated from the staff of the SDE. It could include representation from other involved state agencies as well, for example state departments of conservation. The principle function of the steering committee centers around:

1. Through contracting with special in-state groups to write curriculum materials; to edit and approve all materials produced and coordinate writing efforts.

2. To initiate and work with two additional groups: one would develop a pre-service/in-service implementation model. The second group would concern itself primarily with communication: newsletters and forums. It could also function as an editorial board.

3. Special projects for example; ITV Program: "Sesame Street" is a prime example.

V. STRATEGIES FOR THE IMPLEMENTATION OF AN IN-SERVICE/PRE-SERVICE MODEL

The state department of education should assume a leadership role in in-service and pre-service training of teachers, to orient and reorient teachers and administrators to a commitment to environmental education concepts. This would involve working with teacher training institutions, local school district, and resource groups sponsoring workshops.

The state department of education should utilize all media of communication including educational television, in particular, to educate people at all levels in environmental education concepts.

To advise local schools of services, of resource agencies and to work with those state and local agencies interested in environmental resources.

VI. STRATEGIES FOR IMPLEMENTING ENVIRONMENTAL PROGRAMS ON A STATE-WIDE BASIS

Take inventory of environmental education resources that can be made available to the schools. These resources include curriculum and teaching materials; exemplary programs; physical facilities; resource teachers and knowledgeable persons from industry, business colleges and universities, private organizations, and public agencies other than schools.

Set up regional conferences within-state to assess resources and needs; determine objectives for state, regional, and local areas; and plan actions to meet these needs.

Assist community groups to identify free spaces or land areas which could be acquired for environmental study purposes.

Assists community groups explore ways to finance and build resident housing as part of the regular school program.

Design environmental education work-study projects for students with assistance from higher education institutions, business, industry, colleges and community organizations.

GROUP IV - ENVIRONMENTAL EDUCATION

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I. Definition

II. Position Statements of the Council of State Science Supervisors

III. Goals and Objectives

IV. Suggested Concepts for Environmental Education Programs

V. Strategies for Implementation

VI. Responsibilities of State-level Personnel

I. Definition

Environmental education is the study of the interaction of organisms with their surroundings. This includes all endeavors and confrontations between individuals.

II. Position Statements of the Council of State Science Supervisors

1. One of the urgent educational tasks of our times is that of alerting the public to the conditions of our environment. This task must, in large part, be accomplished through our schools.

2. Environmental education should be integrated into the total curriculum, grades K-12 (and even beyond).

3. A clearinghouse system should be established for the purpose of collecting and disseminating Environmental Education materials and information.

4. The U.S. Office of Education, the National Science Foundation, the National Institute of Health and other agencies should be encouraged to support funding of appropriate activities in environmental education.

5. Elected and appointed representatives at all levels are encouraged to support legislation dealing with the quality of our environment including education programs at the local, state, and national levels.

6. The Council recommends additional staff to coordinate environmental education activities.

7. The USOE, the NSF, the NIH and other agencies should be encouraged to give consideration to the development of a TV program on Environmental Education to be broadcast nationally. Ideas regarding techniques and format for such a program might be drawn from programs such as "Captain Kangaroo" and "Sesame Street."

III. Goals and Objectives

1. To increase the students' awareness, appreciation, and understanding of the interdependence and interrelationship of the earth's natural resources.

2. To help students grow in ability to accept responsibility for doing all they can to maintain and make wise use of resources in their environment in order that people now and in the future may receive maximum benefit from these resources.

3. To provide opportunities for students to develop and improve their skills and techniques in using natural resources.

4. To guide students in developing in understanding of the principle that to improve the quality of life now and in the future, there is no substitute for wise use of the earth's resources.

5. To enable students to develop respect for all resources, regardless of ownership, public or private.

6. To help students increase their appreciation of the value of natural resources in preserving and improving ways of living.

7. To assist students in developing an understanding of the interrelationships of environmental educations in the many subject matter fields.

8. To guide students in developing an awareness of active environmental practices by everyone.

IV. Suggested Concepts for Environmental Education Programs

1. The earth we live on is finite; the resources of the world are exhaustible.

2. The world is not just for mankind; living things are interdependent.

3. Man is the dominant species but yet is a part of nature, not separate from it.

4. Any organism that has lived or will live in the future uses some of its surroundings.

5. Organisms (or population of organisms) are the product of their heredity and environment.

6. Living things and environments are in constant change.

7. The world is a series of systems; the world is a system; the world is part of a system.

V. Strategies for Implementation of State Environmental Education Programs

1. Organization of an advisory council at the state and local level. This should include representation from resource agencies and other appropriate groups.

2. Assess the status of environmental education within the state: e.g. programs, facilities, resources, etc.

3. Develop a position paper, including guidelines.

4. Organize teacher workshops and in-service training programs.

5. Advise and counsel teacher-training institutions on content, methodology, materials, and programs for prospective teachers.

6. Assist local school districts in obtaining financial assistance for their respective programs.

7. Identify and develop appropriate curriculum materials.

8. Work with school planners, and architects on school site development.

9. Coordinators of environmental education activities should make available consultant services to local school districts.

VI. Responsibilities of State-level Personnel

1. To develop a philosophical and structural framework for a state-wide program in environmental education.

2. To provide educators with environmental education concepts appropriate to the various curriculum areas, K-12.

3. To assist each local school district in developing and establishing its own integrated environmental education programs at all grade levels.

4. To provide opportunities for educators to learn more about the environment through in-service workshops, pre-service classes, field trips, etc.

5. To assist schools in use of the out-of-doors as a laboratory by:

   a. Assisting school districts in finding lands, public and private, suitable for use as outdoor laboratories.

   b. Assisting schools in planning the uses of the school grounds or adjacent lands as outdoor laboratories.

   c. Assisting schools in developing nature trails.

6. To develop and maintain an up-to-date resource file and disseminate, from that file, pertinent information to local districts.

7. To assist educators in the development of instructional materials needed to implement good environmental education programs.

8. To develop procedures for evaluating the effectiveness of the many facets of the environmental education program in the state.

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PHILOSOPHY

Men of every nation are presently confronted by extremely serious environmental problems. The causes of many of these problems have been explained by environmental scientists using the most creditable theories pertaining to complex ecological interactions. Extrapolations based upon such studies have led to the prediction of future disasters. Little success, however, has been achieved in using the methods and techniques of science to assure that alarming environmental trends can be reversed. Scientists and technologists may devise means of reducing undesirable effects of human activities on the environment, but so long as individual, industrial and political priorities remain unchanged, degradation will inevitably follow.

Since education influences behavior, solutions to existing environmental problems may result from the cultivation of desirable attitudes and value systems through carefully planned educational programs.

Educational practices can temporarily change the behavior of some by indoctrination. In extreme emergencies such procedures may be valuable. However, the temporary nature of such changes and subjective judgments concerning which kinds of behavior are most needed make dogmatic techniques ineffective or even undesirable.

Educational programs should be designed to provide a humanizing general education that will nurture individual values which encourage the adjustment of personal life styles to the best interests of society as a whole, and which will lead to a cooperative effort to maintain a quality environment.

General education must use resources from all the disciplines outside. Science education, as one component of the total experience, is particularly suited for the employment of investigatory processes which can be provided in imaginative ways to help students understand environmental interactions. Comprehension of the contents and processes of science as a significant portion of human culture contributes to the development of values which dramatically influence peoples' behavior.

OBJECTIVES

1. To convince educators that Outdoor Education is a part of Environmental Education.
2. To establish Environmental Education as an on-going part of the Education program.
3. To establish Environmental Education as a program ranging from early years to adulthood.
4. To establish a rapport between representatives of federal, state, and local educational agencies which will contribute to the development of productive Environmental programs.
5. Develop a diversified inventory of appropriate materials essential to the successful implementation of constructive Environmental programs.

6. To help describe a program of pre-service and in-service education that will adequately prepare instructors to teach Environmental Education concepts.

7. Establish a working rapport between educators and groups representing diverse agencies and organizations involved in Environmental matters.

8. To establish programs which reflect the interdisciplinary nature of Environmental Education.

ORGANIZATION AND COMPOSITION OF STATE-WIDE COMMITTEES

A. Environmental/Ecological Education Advisory Committee EEE.

1. To serve as an advisory group to the State Department of Education and through it to the school districts.

2. To serve as a medium for exchange of information among state agencies and other interested organizations and/or working in environmental ecological education.

3. To provide a medium through which programs may be cooperatively developed to train teachers to integrate environmental ecological concepts in existing curriculums.

The above committee (EEE Advisory Committee) is usually appointed by the State Commissioner of Education, State Chief School Office or Superintendent, and consists of members from all governmental agencies.

B. Continuing Committee on EEE, State Department of Education.

This committee should be comprised of representatives from divisions within the State Department of Education and should have final responsibility in forming groups of special consultants for developing their own program. The program should be designed to educate children and adults in proper management of our environment.

The guideline should be specific in the following areas:

1. Pre-service and in-service training concerning EEE.

2. Working with school administrators and Board of Education to promote EEE.

3. Planning outdoor laboratories.

4. Planning curriculum for EEE.

What should the program do?

The CS^3 recommends that our educational institutions provide a program which will give students cognitive and affective processes which support a <u>productive interaction between man and his environment</u>.

What should the student be able to do?

Upon completion of their individual educational experiences, the students of our educational institutions should be able to:

1. Demonstrate a working knowledge of the delicate ecological balances that exist on our planet.

2. Make decisions which facilitate a reinforcing effect on the total environment.

For example - In voting, whether or not to litter, etc.

3. Demonstrate a personal commitment to the environment as it will be inherited by future generations (ask all environmental questions in this light).

4. Exhibit divergent thinking toward creative solutions.

5. Participate as a functioning member of a team which utilizes the concept of multi-disciplinary action.

The CS^3 recommends that an action program which implements the above mentioned objectives be developed with all possible expediency to do this:

1. Carefully analyze the on-going programs to identify activities, experiences or situations where inquiry and discovery approaches exist. This analysis should provide the model for environmental education: for example: Man, A Course of Study, SCIS, ESS, Man Made World.

2. Support grass roots involvement in the production of Environmental Education materials, strategies and programs. Open up effective communications channels between the involved educators.

3. Strive for the implementation of programs which start with young children and are continuous throughout all of students' experiences.

The Science Supervisor should:

1. Help with needs assessment.

2. Spearhead interagency cooperation and coordination.

3. Identify and develop strategies which force more group interaction in teacher training and in-service programs.

Curriculum Materials and Publications

Talent, time, and funds must be made available for the continuing generation of appropriate materials and publications whose quality maximizes the chances of their being used effectively. Such products should be designed specifically to meet the needs and stimulate the interests of various age groups. They must reflect an awareness of a wide range of socio-economic and geographic differences among students and teachers throughout the nation.

Means must be provided for the convenient exchange and widespread distribution of current materials and publications. Annotated bibliographics should be up-dated at regular intervals. A practical means must be devised for evaluating items as they become available.

Pre-service and in-service assistance must be provided to prospective and practicing teachers in how these materials can be employed most productively.

A partial listing of curriculum materials, publications and resources would include:

reference works, texts, general interest publications, monographs, films, tapes, transparencies, film strips, periodicals, pictures, slides, charts, models, suggested investigations, taxonomic keys, field equipment and guides for using such resources as school sites, parks, zoos, gardens and city streets.

Strategies for Implementing Environmental Education

In order to implement Environmental Education Program from the state level the following things must take place:

1. Total staff commitment at the State Department level beginning with the state chief school officer right on down.

2. Interdisciplinary guidelines developed at state level to set the stage or pace for counties to follow.

3. A basic state philosophy.

4. An awareness program should be developed to orient superintendents, curriculum councils and sub committee.

5. County planning committee should be formed to study and plan activities that involve industry and government agencies.

6. Extensive pre-service and in-service programs.

Basic Teaching Methods at the Classroom Level

1. Inductive methods

   Discover relationships by seeing, feeling, smelling (!) etc. This involves such things as field trips in out-of-doors areas, camps, nature centers, industrial visits, the sea, river, or lake shores.

2. Direct experience is essential.

3. Frequent exposure, not sporadic experience.

4. Expanding increasingly sophisticated activities appropriate to the chronological, emotional and experiential level of the students.

5. Multi-media materials: films, tapes, TV, monographics, nature centers, camping experiences.

6. Real life experience provides a base for change to something better (Topia to Utopia).

7. It is instructive, exciting, and sometimes rewarding to see how far man has come from bare survival. Not all we have done is bad.

8. Don't overlook the available resources (i.e., parks, garden clubs, scouts, 4-H, Audubon Society).

9. Investigate ESEA - III projects in Environmental Education. Some have worked on teaching methods, e.g., "Lighthouse Project; Marshfield, Mass." - "Oceanographic Education Project; Folworth, Mass." State Departments of Education and USOE have lists and directories of these.

10. Interests and hobbies should serve lifetime needs. Environmental Education has this among its objectives; e.g., camping, skiing, bird watching, swimming are part of the multiple use concept.

Two Approaches

Some Thoughts on Implementation Components

I. Program Development

II. Teacher Training

III. Actual District Implementation

I. Program Development

A. Analyze on-going programs for clues. If inquiry and discovery-oriented programs are desirable, use these strategies as a model.

B. Put outdoor education into the perspective of the total program.

C. Certain programs must be relevant to the city child.

D. Program should be staged so as to incorporate what we know about learning and child development.

II. Teacher Training

A. Should be geared to be pre-service as well as in-service education with a multiplier effect.

B. The overall theme should be pointed toward student involvement.

C. A setting which facilitates group interaction should be emphasized.

D. Mechanisms incorporated to encourage interaction between workshop staff consultants and participants should be designed.

E. Strategies incorporated for creative involvement by the teachers is a necessity.

III. Actual Implementation

A. States should provide a mechanism for in-depth consultant services in Environmental Education.

B. Attempts should be made to match the promising practices and strategies now in existence in classrooms with environmental topics and concepts as well as developing creative new ones.

C. A clearinghouse for information, research results, curricular publications and classroom materials should be developed. These should be adequately funded and staffed.

D. Encourage effective legislation at all levels.

Appendix B

Conservation

While in search for what was meant to be,
I found conservation began with me!

To cleanse my mind of all debris and pollution,
Was the one and only proper solution.

From an unearthly lesson taught by the birds and bees,
The imparting message of the willow trees.

The mighty oceans, the lakes, the streams,
They too tell of the Creator's scheme.

What a beautiful revelation,
To discover that I am conservation!

Leo Huff

STATE SCIENCE SUPERVISORS' CONFERENCE ON ENVIRONMENTAL EDUCATION
SHERATON MOTOR INN, PORTLAND, OREGON
MAY 1 - 5, 1970

PROGRAM

Friday, May 1

8:00 a.m.	Registration	California-Oregon Room
8:30 a.m.	Welcome to the Conference: Dr. Michael Fiasca Conference Director Portland State University	
	Welcome from the Governor's office and Report on the Governor's Committee on Natural Resources Kessler Cannon Administrative Assistant to Governor McCall State of Oregon	
9:15 a.m.	General Session A: address Dr. Harry Kramer, Director Office of Manpower Development National Air Pollution Control Administration Research Triangle Park, North Carolina	
10:15 a.m.	Coffee Break	
10:30 a.m.	Reaction Panel A Sigmund Abeles, Connecticut Charlotte Purnell, Delaware Stan Shaw, Louisiana Calvin Story, Texas	
11:00 a.m.	Small Group Session A	Areas 1, 2, 3 Rooms 240, 242
12:15 p.m.	NO HOST LUNCH	
1:45 p.m.	General Session B: address "Environmental Education as Liberation" Dr. Donald W. Stotler Science Supervisor Portland Public Schools	
2:45 p.m.	Coffee Break	

3:00 p.m.	Reaction Panel B Jan Holman, Kansas John Hooser, Missouri Jack Hopper Florida James Metzdorf, Colorado	
3:30 p.m.	Small Group Session B	Areas 1, 2, 3 Rooms 240, 242
5:00 - 6:30	Reception Hosted by OMSI Kits Special Guest: Dr. William H. Pickering, Director Jet Propulsion Laboratory Calif. Institute of Technology N.A.S.A.	West Ballroom

Saturday, May 2

9:00 a.m.	General Session C: address Dr. Karl Dittmer, Dean Division of Science Portland State University	West Ballroom
10:00 a.m.	Coffee Break	
10:15 a.m.	Reaction Panel C Jerry Colglazier, Indiana Beverly Graham, New Mexico James Latham, Maryland Richard Peterson, Utah	
10:45 a.m.	Small Group Session C	Areas 1, 2, 3 Rooms 240, 242
12:00 - 1:30	NO HOST LUNCH	
1:30 p.m.	General Session D: address Dr. John H. Thomas Department of Biological Science Stanford University	West Ballroom
2:30 p.m.	Coffee Break	
2:45 p.m.	Reaction Panel D James Garner, Washington Frances Jones, Alabama Richard Kay, Idaho Dallas Stewart, Georgia	
3:15 p.m.	Small Group Session D	Areas 1, 2, 3 Rooms 240, 242
5:00 - 7:00	Hospitality Hour: Hosted by Prentice-Hall Inc.	Washington Room

Sunday, May 3

8:45 a.m. - 4:30 p.m.	Field Study of Environmental Resources: Columbia River, Bonneville Dam, Mt. Hood National Forest Jim Anderson, Naturalist Ernest McDonald, Education Officer, U.S. Forest Service Anne Heisler, Forester, Mt. Hood National Forest Dr. Ralph Mason, Oregon State Dept. of Geology and Mineral Industries	
12:00 noon	Special Luncheon in Hood River Hosted by the American Book Co.	
5:00 - 7:00	Hospitality Hour: Hosted by Rand McNally and Co.	Washington Room

Monday, May 4

8:30 a.m.	General Session: address "Industry and the Environment" George Schroeder, Chief Forester N.W. Timberlands Division Crown Zellerbach Corporation	West Ballroom
9:15 a.m.	Report from States	
12:00 noon	NO HOST LUNCH	
1:30 p.m.	Small Group Writing Session I	Areas 1, 2, 3 Rooms 240, 242
3:45 p.m.	General Session: Progress Reports	West Ballroom
5:00 - 7:00	Hospitality Hour: Hosted by Holt, Rhinehart and Winston, Inc.	Location to be posted in lobby

Tuesday, May 5

8:30 a.m.	Small Group Writing Session II	Areas 1, 2, 3 Rooms 240, 242
11:00 a.m.	General Session: Reports	Oregon-Washington Room
12:00 noon	NO HOST LUNCH	
1:30 p.m.	Reports and Conclusion	Washington Room
3:00 p.m.	Adjournment	